A unique operator for verbal pluractionality and numeral distributivity[1]

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Abstract. Cardinal numerals in Seri (isolate, Mexico) are verbs, which, like most verbs in this language, can express pluractionality, i.e. multiplicity of events. I argue that pluractional numerals are interpreted as distributive numerals and give a description of their distributive properties. I propose a fully compositional analysis of pluractionality which can combine with numerals and other verbs to derive the observed effects of each.

Keywords: distributivity, pluractionality, numerals, Seri

1. Introduction

In Seri (sei, isolate, Mexico), numerals are verbs which have a paradigm consisting of two morphologically unpredictable forms, for instance the word corresponding to 'six' has two forms: the (morphologically) simple form *isnaap cazoj* and the (morphologically) complex form *isnaap cazlc*.[2] I argue that complex numeral forms are pluractional forms; just like other verbs in Seri which mark pluractionality (Moser, 1961; Marlett, 2016; Cabredo Hofherr et al., 2018; Pasquereau and Cabredo Hofherr, 2020, 2021). For instance in (1), the use of the pluractional verb form (glossed PLUR) entails that the context of the utterance provides at least two events of making *x* tubular where *x* is a plurality of trees or a single tree. (Note that the suffixal morphology of Seri verbs is very complex and unpredictable, in particular exponents for pluractionality and subject number vary widely from one verb to the next (Moser, 1961; Marlett, 2016; Baerman, 2016), therefore readers are asked to trust that the glosses are correct.)

(1) [Juan quih] [hehet pac] / [hehe z] iyahoiilc.
Juan DET tree.PL INDEF.PL tree INDEF.SG 3>3.RLYO.CAUS.be_tubular.**PLUR**
'Juan made trees into tubular pieces' / 'Juan made several tubes out of a tree'.[3]

While there is a rich literature on verbal pluractionality (Dressler (1968); Xrakovskij (1989, 1997); Lasersohn (1995) among many others) and verbal pluractionality in Seri has been studied in the aforementioned references, it is not obvious what it means for a numeral to be pluractional.[4] My investigation reveals that they have properties typical of so-called distributive numerals in other languages. For instance, in (2), the use of the pluractional numeral entails that Juan made tubular at least two batches of six trees.

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[2]Glosses follow the Leipzig conventions except for the following abbreviations: RLYO: realis yo-form, RLMI: realis mi-form, RLT: realis t-form. The abbreviation SC stands for Speaker(s) Comment(s). The symbols ⌞ ⌟ are used to delimit a phrase in Seri corresponding to a single word or expression in the English gloss.

[3]Example identifier: [Questionnaire2FT5]

[4]Recent work reports on a similar situation in other languages: in ʔayʔaǰuθəm (Comox-Sliammon Salish) (Mellesmoen, Davis, and Matthewson, 2020), in Piipash (Yuman) (Gordon, 1986; Henderson, Pasquereau, and Powell, 2020).

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(2) [Juan quih] [hehet quih ⌞isnaap cazlc⌟] iyahoiij.
Juan DET tree.PL DET SBJ.NMLZ.be_six.**PLUR** 3>3.RLYO.CAUS.be_tubular
'Juan made tubular batches of six trees.'[5]

This paper aims to develop an analysis of pluractionality in Seri such that when it combines with numerals, the distributive numeral effects in sections 3 and 4 are derived, and such that when it combines with other verbs, the verbal pluractionality effects described in Cabredo Hofherr et al. (2018); Pasquereau and Cabredo Hofherr (2020, 2021) are derived. Building on previous analyses of pluractionality and numeral distributivity, I propose a unified meaning of pluractionality in Seri and a full compositional analysis of its combination with numerals and other verbs. The analysis explains the semantic properties they have in common.

Section 2 shows that Seri complex numerals are pluractional numerals: they are verbs, verbs in Seri express pluractionality, so morphologically-speaking it is expected that numerals would express pluractionality as well. Section 3 shows that Seri pluractional numerals are distributive numerals according to the definition of Cable (2014), and section 4 describes a number of their properties. Section 5 starts with a presentation of my analysis of the morphosyntax and semantics of pluractional constructions in Seri and finishes by discussing some of the potentially surprising as-of-yet unchecked predictions that this analysis makes. Section 6 concludes.

2. Seri complex numerals are pluractional numerals

2.1. Seri numerals are verbs

All numerals in Seri (and most quantifiers) are intransitive verbs, except *tazo* 'one', which is one of the few adjectives in the language (Marlett, 2016: 597). Numerals that are derived from *one*, e.g. *eleven*, are verbs.[6] Numerals inflect like verbs for features such as tense/aspect/mood, person-number (*cf.* 3a and 3b), have the same syntactic distribution as verbs, and can be causativized (4).

(3) a. Ham-oocj.
1PL.RLMI-be_two
'There are two of us.' (lit. We are two.)[7]

b. Ham-iizcam.
1PL.RLMI-arrive.PL
'We have arrived.' [8]

(4)

non-causative	causative
-oocj 'be two'	-ahoocj 'give birth to twins'
-aafzx 'be quick'	-ahaafzx 'make quick'

Like other verbs, they can appear in a finite (dependent) form (5) or in a subject nominalized form (6).

[5]Example identifier: [QuestionnaireAFT5]
[6]The numeral adjective *tazo* is obviously cognate with the verb *-azoj* 'be alone'.
[7]Example identifier: [EDSEI28ABR2019DRPM.ATHF.GH.GHF].
[8]Example identifier: [EDSEIFLD3POST] The abbreviation PL on the verb marks that the subject is plural.

(5) a. Hoyácalcam quih t-oocj, yihiimtoj.
1POSS:OBJ.NMLZ:have_as_sibling.PL DET DPT.RLT-be_two RLYO.marry.PL
'My two brothers got married.'[9]

b. ⌞Xiica quiistox⌟ quih t-aazcam, yihiimtoj.
thing.PL SBJ.NMLZ:have_spirit.PL DET RLT:come.PL RLYO:marry.PL
'The people came, and got married.'[10]

(6) a. Hoyácalcam quih c-oocj yihiimtoj.
1SG.brother.PL DET SBJ.NMLZ-be_two RLYO.marry.PL
'Two brothers of mine got married.'[11]

b. ⌞Xiica quiistox⌟ quih c-aazcam coi
thing.PL SBJ.NMLZ:have_spirit.PL DET SBJ.NMLZ:come.PL DEF.PL
yihiimtoj.
RLYO:marry.PL
'The people who came got married.'[12]

2.2. Seri verbs express pluractionality

In addition to marking subject number, most verbs in Seri have distinct pluractional forms (7), contrasting with an underspecified neutral form (Pasquereau and Cabredo Hofherr, 2021).[13]

(7) Pluractionality (Newman, 1980)
The expression of multiple eventualities by markers on the verb.

Pluractional forms of verbs in Seri require the context to provide at least two V-events. Thus, the sentence with the pluractional form *cöiyeemla* is false in context A but true in context B because at least two events of opening can be identified.

(8) Context A: The house has one door, no windows. Juan opened it yesterday to air it out. FALSE[14]
Context B:The house has several doors and windows. Juan opened it yesterday to air it out. TRUE[15]
Juan quih haaco cap cöiyeemla.
Juan DET house DEF.SG 3IO:3>3.RLS.YO:CAUS:open.PLUR
'Juan opened the house.'

[9]Example identifier: [EDSEI8MAY2019DRPM, ELAB]
[10]Example identifier: [EDSEIPOSTFT5]
[11]Example identifier: [EDSEI8MAY2019DRPM, CON]
[12]Example identifier: [EDSEIPOSTFT5]
[13]To be more specific, Seri has two types of pluractionality. Here I only talk about the type of pluractionality called 'distributional' in Pasquereau and Cabredo Hofherr (2021).
[14]Example identifier: [QuestionnaireAFT5]
[15]Example identifier: [Questionnaire2FT5]

2.3. Seri numerals have pluractional forms

Numerals in Seri have two forms except the word for 'eight' (which may be historically related to 'four').[16]

(9) Numerals

1	tazo (adj)	tazlc (adj)
2	coocj	coocalcam
3	capxa	capxoj
4	czooxöc	czooxojoj
5	cooitom	coiitmoj
6	isnaap cazoj	isnaap cazlc
7	tomcoj cöquiih	tomcoj cöquiihtoj
8	czooxolcam	
9	csooi chanl	csooi chanaloj
10	chanl	chanaloj
11	ihanl tazo cöquiih	ihanl tazlc cöquiih

Given that Seri numerals (minus *tazo* 'one') are verbs and that verbs express pluractionality, I hypothesize that the numerals in the right-hand column in (9) are pluractional forms.[17]

(10) Pluractional hypothesis:
Complex numeral forms like *-apxoj* 'three' are pluractional forms

In the next section, I argue that pluractionality on numerals produces distributive numerals, that is numeral indefinites whose reference must covary with another plurality (Farkas, 1997).

3. Seri pluractional numerals are distributive

I use the definition given by Cable (2014) in (11) to argue that pluractional numerals have properties of distributive numerals.

(11) Distributive numeral (Cable, 2014)
A morphosyntatic construction containing a numeral, whereby
(i) the sentence as a whole receives a distributive reading, and
(ii) under the allowable readings, the numeral contained within the construction must be interpreted *as if* it is within the scope of a distributive operator.

First, sentences containing distributive numerals enforce distributivity and rule out both collective and cumulative readings (Gil, 1982; Choe, 1987; Oh, 2006); the same holds for pluractional forms of Seri numerals. The stimuli used in this section adapt examples from Cable (2014) (pictures are not included for reasons of space).

[16] Seri speakers use the citation form/subject nominalized form when counting (e.g. tazo, coocj, capxa, ...). Seri has a decimal numeral system. Numbers from 6 to 9 are analyzable as complex expressions, see Marlett (2016).

[17] Since verb stems express both pluractionality and subject number, an alternative hypothesis would that these forms mark subject number, not pluractionality. There is evidence however that this is not the case because unlike other verb pairs (e.g. *-acösxaj/acöla* 'be tall') both forms of numerals are compatible with a plural subject. Furthermore, it is not clear that the meaning of these verbs (i.e. a numeral meaning) lends them to express a subject number distinction, i.e. we expect all numeral verbs above 'one' to have a plural subject.

Seri PLUR-numerals are not compatible with a collective scenario: e.g. in a context where three dogs are washed together at the same time by a group of two girls as in (12), only the simple numeral can be used truthfully (12a) whereas (12b) which contains a pluractional numeral is false.

(12) **Collective context**
I have three dogs. Two girls came to wash them at 2pm. María and Alina together bathed Zombi, Lalo, and Mía at the same time. Picture E. [18]

a. [Xicaquiziil cmajiic quih] [**haxaca quih c-apxa**] ⌞hax an child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three water [3POSS]in iyahaalam⌟.
3>3.RLYO.CAUS.play.PL
'The girls washed three dogs.' TRUE

b.# [Xicaquiziil cmajiic quih] [**haxaca quih c-apxoj**] ⌞hax child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three.PLUR water an iyahaalam⌟.
[3POSS]in 3>3.RLYO.CAUS.play.PL
'The girls washed three dogs.' FALSE, SC: if they are in the same tub, *capxoj* can't be used, it's for a pair of three

Seri PLUR-numerals are not compatible with cumulative scenarios. Thus, in a scenario where one girl bathes one dog while another bathes two dogs (13), it is true to utter (13a) with the simple numeral whereas it is false to utter the minimally different sentence with the pluractional numeral (13b).

(13) **Cumulative scenario**
Context: I have three dogs. Two girls came to wash them at 2pm. Alina washed one and María washed the other two. Picture F [19]

a. [Xicaquiziil cmajiic quih] [**haxaca quih c-apxa**] ⌞hax an child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three water [3POSS].in iyahaalam⌟.
3>3.RLYO.CAUS.play.PL
'The girls washed three dogs.' TRUE

b.# [Xicaquiziil cmajiic quih] [**haxaca quih c-apxoj**] ⌞hax child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three.PLUR water an iyahaalam⌟.
[3POSS].in 3>3.RLYO.CAUS.play.PL
'The girls washed three dogs.' FALSE, SC: because one girl washes one dog and the other washes two, but the sentence says that each one washes three dogs.

However, Seri PLUR-numerals allow distributive readings: in (14) where one girl bathes three dogs while a second girl washes another three dogs, the sentence with the pluractional numeral is judged true whereas the one with the simple numeral is judged false.

[18] Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]
[19] Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]

(14) **Distributive scenario**
Context: I have six dogs. Two girls came to wash them at 2pm. While Alina washed 3, María washed the other 3. Picture G. [20]

a.# [Xicaquiziil cmajiic quih] [**haxaca quih c-apxa**] ⌞hax an
child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three water [3POSS].in
iyahaalam⌟.
3>3.RLYO.CAUS.play.PL
'The children washed three dogs.' FALSE, SC: because the sentence says that there are three dogs not more, but there are actually six dogs.

b. [Xicaquiziil cmajiic quih] [**haxaca quih c-apxoj**] ⌞hax
child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three.PLUR water
an iyahaalam⌟.
[3POSS].in 3>3.RLYO.CAUS.play.PL
'The children washed three dogs.' TRUE

The contrasts seen above indicate that pluractional numerals in Seri possess the property in (11i). They also possess the property in (11ii): indeed, in Seri, the numeral bearing PLUR-marking must be the one that is multiplied *as if* it were in the scope of a distributive operator.

In a scenario where three pairs of girls bathe one dog each (14), at the same time, (15a) is false whereas (15b) is true. This is because only the referent of the subject DP *two girls* is distributed over the plurality of dogs of cardinality three.

(15) **Num-MULT is distributed**
Context: We have three dogs. Six girls came over to bathe them. Each dog was bathed by a team of two girls. Picture H. [21]

a.# [Xicacaziil cmajiic quih c-oocj] [**haxaca quih**
girl.PL woman.PL DET SBJ.NMLZ-be_two dog.PL DET
c-apxoj] ⌞hax an iyahaalam⌟.
SBJ.NMLZ-be_three.PLUR water [3POSS]in 3>3.RLYO.CAUS.play.PL
'Two girls bathed three dogs.' FALSE, SC: because in the situation, there are three groups of two girls, but in the sentence it is understood that there are only two girls washing three dogs.

b. [**Xicacaziil cmajiic quih c-oocalcam**] [haxaca quih
girl.PL woman.PL DET SBJ.NMLZ-be_two.PLUR dog.PL DET
c-apxa] ⌞hax an iyahaalam⌟.
SBJ.NMLZ-be_three water [3POSS]in 3>3.RLYO.CAUS.play.PL
'Two girls bathed three dogs.' TRUE

In summary, Seri pluractional numerals are distributive numerals according to Cable's definition because: (i) sentences containing a PLUR numeral must receive a distributive readings, and (ii) the PLUR numeral must be multiplied/interpreted *as if* in the scope of a distributive operator.

[20] Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]
[21] Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]

Figure 1: Distributive dependencies in (14b)/(16)

SORTAL KEY: the girls		DISTRIBUTED SHARE: 3-PLUR dogs
Alina	——————-	3 dogs
María	——————-	3 dogs

4. Properties of Seri distributive numerals

The last section showed that NPs containing pluractional numerals must distribute over another plurality. Research on distributive numerals has shown that they differ on several parameters cross-linguistically (Gil, 1982).This section situates Seri distributive numerals typologically.

4.1. Types of distributive dependencies allowed

One of these parameters is the type of plurality that distributive numerals can or must distribute over (i.e. covary with). In discussing this, I will use the terms introduced by Choe (1987), where distributivity is analyzed as a relationship between the atoms of the SORTAL KEY and the DISTRIBUTED SHARE. In this terminology, the NP containing the distributive numeral denotes the distributive share which is distributed over a sortal key. As an illustration, consider (14b) repeated in (16) in the indicated distributive context: the NP containing the pluractional numeral *haxaca quih capxoj* 'three dogs' denotes the distributed share, and, in this context, the NP *xicaquiziil cmajiic quih* 'the girls' denotes the sortal key (see figure 1).

(16) Context: I have six dogs. Two girls came to bathe them at 2pm. While Alina bathed 3, María bathed the other 3. Picture G. [22]
[Xicaquiziil cmajiic quih] [**haxaca quih c-apxoj**] ⌞hax
child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three.PLUR water
an iyahaalam⌟.
[3POSS].in 3>3.RLYO.CAUS.play.PL
'The children bathed three dogs.' TRUE

Thus, example (14b)/(16) shows that the sortal key can be made up by a plurality of participants.

The sortal key can be temporal: in (17) the referent of *zixcam quih capxoj* 'three fish' covaries with a plurality of times, which incidentally also illustrates that pluractional numerals in Seri can be licensed by a non overt licensor unlike distributive numerals in e.g. Kaqchikel (Farkas, 1997; Balusu, 2006; Henderson, 2012).

(17) Context: Today, every hour, my son Juan caught 3 fish. Picture I.
Juan quih **zixcam quih c-apxoj** iyoocö.
Juan DET fish DET SBJ.NMLZ-be_three.PLUR 3>3.RLYO.kill
'Juan caught three fish (repeatedly).' TRUE[23]

The sortal key can also be spatial: in (18), shares of three girls are distributed over different running tracks.

[22]Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]
[23]Example identifier: [EDSEI15NOV2019DRPM.ATHF.GHF.AMMO.GH]

(18) Context: Today there was a race between several groups of three girls. Each group of three girls is in a different running track. Picture J.
Xicaquiziil cmajiic quih c-apxoj yopancojc
child.PL woman.PL DET SBJ.NMLZ.be_three.PLUR RLYO.run.PL
'The girls ran in groups of three.' TRUE[24]

The pluractional numeral DP can thus be distributed to (i) times, (ii) participants, or (iii) locations, a situation which conforms to the traditional parameters that have been recognized as sortal keys for distributive numerals and as event individuating parameters in the pluractionality literature (e.g. Lasersohn 1995). But the distributive share encoded by the pluractional numeral DP can be distributed over more parameters that cannot be obviously reduced to any of the previous three, e.g. fish species (19) or book topics (20)

(19) Ihyaazi quih **zixcam quih c-apxoj** iyoocö.
1SG.son DET fish DET NMLZ-be_three.PLUR 3>3.RLYO.kill
'My son caught three fish (of different species).' TRUE, SC: if in one outing, he catches 3 fish of many species [25]

(20) Juan quih ⌞**hapaspoj** **hanoocaj**⌟ **quih**
Juan DET SBJ.NMLZ:PASS:write SBJ.NMLZ[PASS]:carry_under_arm DET
c-oocalcam sacaaitom caha.
SBJ.NMLZ-be_two.PLUR IRR.IND.read SBJ.NMLZ.AUX
'Juan is going to read two books (on a variety of themes).' TRUE, SC: 2 on a similar theme, 2 more on another theme, ...)[26]

In fact, there is evidence that the plurality constituting the sortal key can be manipulated by contextual saliency. Thus if nine girls are running together, but groups of three can be identified by the plurality of their purposes, the pluractional numeral is licensed.

(21) Context: A group of nine girls ran together yesterday. Three wore a green shirt, three wore a red shirt, and the other three wore a yellow shirt in support of different charities. Picture K.
Xicaquiziil cmajiic quih c-apxoj yopancojc
child.PL woman.PL DET SBJ.NMLZ.be_three.PLUR RLYO.run.PL
'Women ran in threes.' TRUE[27]

In fact, what Gil (1982) calls 'NP-internal distributivity', which is also attested with Seri pluractional numerals, can be seen as another case of context sensitivity. Thus in (22), the plurality of shares of two bottles is distributed over the plurality of bags containing them. Picture L.

[24]Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH]
[25]Example identifier: [EDSEI24OCT2018DRPM.GH.ATHF.LKPH, ELAB]
[26]Example identifier: [EDSEI26OCT2018DRPM.GH.ATHF.LKPH, CON, ELAB]
[27]Example identifier: [Questionnaire4FT5]

(22) Context: I saw a woman, she carried bottles in her bags. Picture L.
Cmaam quih **hateeya quih coocalcam** iyoon.
woman DET bottle DET SBJ.NMLZ.be_two.PLUR 3>3.RLYO.carry
'The woman carried two bottles.' TRUE, SC: because there are bags of two bottles [28]

In summary, the distributive share encoded by the pluractional numeral requires that there be more than one group of a particular cardinality. For there to be more than one such group, they need to be differentiated and thus vary along at least one parameter (diversity condition): temporal or spatial location, participants in the eventuality that these groups participate in, species, theme, goals, ...Clearly these parameters are context-sensitive and cannot be listed exhaustively. In the next section, I show that the distributive dependencies licensing Seri pluractional numerals need not be exhaustive nor atomic, unlike distributive dependencies licensing universal quantifiers.

4.2. Exhaustivity/atomicity of distribution

In this section, I compare the type of distributivity induced by pluractional numerals to that induced by the Seri quantifier *DP iij càap tazo cah DP* 'each of DP' following work by Knežević (2015); Knežević and Demirdache (2018); Bosnić et al. (2020) which shows that distributive share markers in Serbian do not require exhaustive or atomic distribution. Example (23) shows that the share encoded by a phrase containing a pluractional numeral does not need to be distributed over atomic women in the participant key (23a) except when the phrase denoting the key contains the quantifier *DP iij càap tazo cah DP* 'each of DP' (23b).

(23) Context: I saw eight women. In pairs (two women carrying a box), they carried bottles. Picture M. [29]
a. Cmajiic coi hateeya quih coocalcam iyoonec.
woman.PL DEF.PL bottle DET SBJ.NMLZ.be_two.PLUR 3>3.RLYO.carry.PL
'The women carried 2 bottles.' TRUE
b. Cmajiic coi ⌞iij càap tazo cah⌟ hateeya quih
woman.PL DEF.PL apart SBJ.NMLZ:stand one DEF.FOC bottle DET
coocalcam/coocj iyoonec.
SBJ.NMLZ.be_two.PLUR/SBJ.NMLZ.be_two 3>3.RLYO.carry.PL
'Each of the women carried 2 bottles.' FALSE, SC: because they are in pairs

Example (24) shows that the share encoded by a phrase containing a pluractional numeral does not need to be exhaustively distributed over women in the participant key (24a) except when the phrase denoting the key contains the quantifier *DP iij càap tazo cah DP* 'each of DP' (24b).

(24) Context: I saw eight women. Six of them carried bottles in their bag and two did not carry anything. Picture N [30]
a. Cmajiic coi hateeya quih coocalcam iyoonec.
woman.PL DEF.PL bottle DET SBJ.NMLZ.be_two.PLUR 3>3.RLYO.carry.PL
'The women carried 2 bottles.' TRUE

[28] Example identifier: [Questionnaire4FT5]
[29] Example identifier: [Questionnaire4FT5]

b. Cmajiic coi ˻iij càap tazo cah˼ hateeya quih
woman.PL DEF.PL apart SBJ.NMLZ:stand one DEF.FOC bottle DET
coocalcam/coocj iyoonec. .
SBJ.NMLZ.be_two.PLUR/SBJ.NMLZ.be_two 3>3.RLYO.carry.PL
'Each of the women carried 2 bottles.' FALSE, SC: two are not carrying anything

In summary, pluractionality in numeral phrases requires that there be more than one group of a particular cardinality, i.e. the sum share must have more than one set of individuals of this cardinality. For there to be more than one such group, they need to vary along at least one contextually specified parameter. That is, groups must be paired with diverse values of a parameter. This pairing between groups and values of a parameter is what gives rise to distributive effects. In cases where the distributive key is constituted of participants, distributed shares do not have to be paired with all of the participants in the key, nor do they have to be paired with only-atomic participants in the key.

5. Analysis

5.1. Assumptions

In order to give a compositional treatment of PLUR-marking on numerals (and other verbs), we must have (i) an analysis of numerals as verbs/predicates of events, (ii) an analysis of nominalization, and (iii) an analysis of the meaning of PLUR.

5.1.1. Numerals as predicates of eventualities in Seri

I assume numeral verbs in Seri to be predicates of eventualities (like other verbs) with a denotation as in (25) (see Champollion 2016, Kuhn 2020 for similar proposals)

(25) $[\![\text{-oocj}]\!] = \lambda e_s .\ |{}^*\text{theme}(e)| = 2$

I will assume that integers are atomic degrees—points on an ordered scale (Cable 2014 i.a.). I use the theta role *theme* (similarly to Cable 2014's use of *participant* or Henderson 2012's use of *theme(e)* or Wellwood 2015's *holder(e)*). I assume cumulativity of theta-roles, i.e. that is, for all events e, e', agent(e $\oplus$ e') = agent(e) $\oplus$ agent(e') (Krifka, 1992).

(26) *theme(e)* is a function of type <s,e>, from eventualities to individuals, such that they bear the theta relation 'theme' to the eventuality e (Henderson, 2012)

I assume that external arguments are introduced by a functional head which combines with a predicate via event identification (27c; Kratzer and Heim 1998).

[30]Example identifier: [Questionnaire4FT5]

(27) a. $[\![v_{AG}]\!] = \lambda x_e.\lambda e_s.$ *agent(e)=x

b. $[\![v_{TH}]\!] = \lambda x_e.\lambda e_s.$ *theme(e)=x

c. Event identification:

f	g	→	h
<e,<s,t>>	<s,t>		<e,<s,t>>
			$\lambda x_e \lambda e_s$ [f(x)(e) & g(e)]

Thus, example (3) has the (simplified) LF and the truth-conditions in (28).

(28) a. Ham-oocj.
1PL.RLMI-be_two
'There are/were two of us.'

b. LF
$[_S \exists e$ [. ... $[_{vP}$ Ha- $[_{vP}$ v_{TH} $[_V$ -moocj]]]]]

c. Predicted truth-conditions
$[\![S]\!] = \exists e.$ |*theme(e)|=2 & *theme(e)=we

Given the unique role requirement (29), *theme* maps the event *e* to the same individual.

(29) Unique role requirement (Champollion, 2010)
If a thematic role is specified for an eventuality, it is uniquely specified.

5.1.2. Nominalization

Following Marlett (2012), I assume that Seri nominalized clauses are internally-headed relative clauses. I assume the nominalization structure in (30) after Toosarvandani (2014) for Northern Paiute, thus the only contribution of nominalization is existential quantification over the event argument in the denotation of the higher vP (this assumption turns out to make an important prediction discussed in section 5.4).

(30) a. Sahmees quih c-apxa coi
oranges DET SBJ.NMLZ-be_three DEF.PL
'The three oranges'

b. LF
$[_{DP}$ [$[_{DP}$ sahmees quih$_1$] [λ_1 $[_{nP}$ $[_n$ c-] $[_{vP}$ PRO$_1$ $[_{vP}$ v_{TH} $[_{VP}$ $[_V$ -apxa]]]]]]] $[_D$ coi]]

Thus the DP *sahmees quih capxa coi* 'the 3 oranges' denotes the unique group of oranges of cardinality 3.[31]

(31) $[\![DP]\!] = \iota x.\exists e.$ |*theme(e)|=3 & *theme(e)=x & *oranges(x)

[31] It is not clear what the determiner *quih* means. Although Marlett (2016) glosses it as singular definite, there is reason to doubt that it is singular or definite: it frequently appears with plural NPs and it can be used in contexts where the indefinite determiners are acceptable with the added nuance that the NP has to denote a somewhat specific set.

5.1.3. Pluractionality

Since the operator PLUR uniformly applies to numerals to yield the distributive effects described above, and to other verbs to yield the verbal pluractionality effects described in Pasquereau and Cabredo Hofherr (2021), the lexical entry I propose for the PLUR-operator (32) builds on proposals made in the verbal pluractionality literature (e.g. Lasersohn 1995) and on event-based proposals in the distributive numeral literature (e.g. Cable 2014) .

(32) $[\![\text{PLUR}]\!]^k = \lambda V_{<s,t>}\ \lambda e_s.\ e = \cup\{e' |\ V(e') \ \&\ e' <^k e\}$, where $e' <^k e = k(e') < k(e)$

The PLUR operator takes as argument a predicate of eventualities V and an eventuality e and returns true iff (i) the eventuality e is composed of at least two proper subevents e' of e according to a contextually-determined event-individuating parameter *k*, and (ii) V holds of the subevents e' of e.

The interpretation of PLUR is sensitive to a contextual parameter *k* which maps eventualities to a contextually-salient parameter of these eventualities (e.g. run time, location, agent, book topic). I model this as an underspecified trace function. As noted by Balusu (2006) there is a plurality requirement which is here captured by proper parthood. This analysis also captures the intuition in Knežević 2015: 139 that explaining how distributive n-NP work (where n is the quantity conveyed by the numeral) "requires referring to events in which exactly n NPs participate".

5.2. Deriving verbal pluractionality

Given the analytical assumptions laid out, the sentence in (8) repeated in (33) has the LF in (33b) and the truth-conditions in (33c).

(33) a. LF
[$_S$ ∃e [$_{vP}$ [$_{DP}$ Juan quih] [$_{vP}$ v_{AG} [$_{vP}$ [$_{DP}$ haaco cap] [$_{vP}$ v_{TH} [$_V$ [$_V$ cöiyeem] [$_{PLUR}$ -la]]]]]]]

b. Predicted truth-conditions
$[\![S]\!]^k = \exists e.\ e = \cup\{e' |\ \text{open}(e') \ \&\ e' <^k e\}$ & *theme(e)=the.house & *agent(e)=Juan

These truth-conditions correctly predict the contrast presented in (8) and repeated in a schematized fashion in (34). The problem with context A is that the house contains just one openable part (i.e. one door), the context thus supplies just one event of opening whereas the semantics of PLUR requires there to be at least two such events. In context B, sub-eventualities are individuated by parts of the house since it contains more than one openable parts. There is a correspondence between the parts of an event and the parts of a participant of that event (by cumulativity of theta relations). E.g. in this context, the theme – the house – of the sum e of subevents e' is the sum of the themes of every subevent e' – parts of the house.

(34) a. Context A: The house has one door, no windows. Juan opened the house.

opening	opener	opened	time
e_1	Juan	$door_1$	t_1

b. Context B: The house has several door and windows. Juan opened the house.

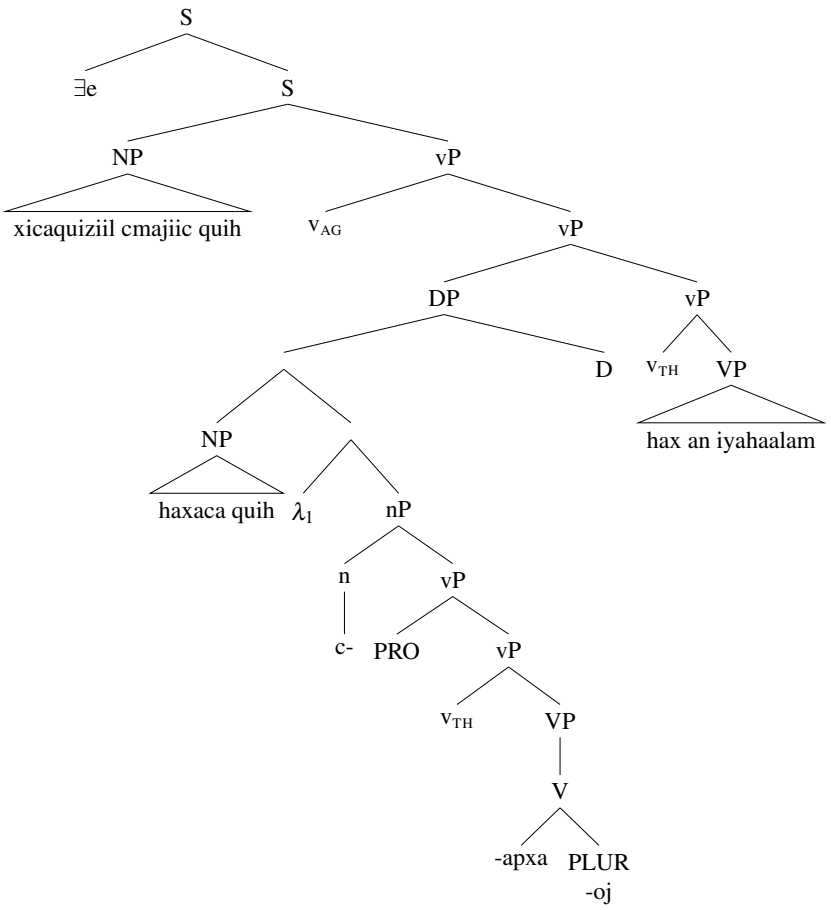
opening	opener	opened	time
e_1	Juan	$door_1$	t_1
e_2	Juan	$window_2$	t_2
e_3	Juan	$window_3$	t_3

5.3. Deriving numeral distributivity

According to the analytical assumptions presented above, the Seri sentence in (35a) has the Logical Form in (35b), which yield the truth-conditions in (35c).

(35) a. [Xicaquiziil cmajiic quih] [**haxaca quih c-apxoj**] ⌞hax
child.PL woman.PL DET dog.PL DET SBJ.NMLZ.be_three.PLUR water
an iyahaalam⌟.
[3POSS].in 3>3.RLYO.CAUS.play.PL
'The girls bathed three dogs.'

b. LF



c. Predicted truth-conditions (see discussion in section 5.4)
$[\![S]\!]^k$=∃e. *bathe(e) & *agent(e)=the.girls & *theme(e)=ιx. ∃e'.e'=∪{e''| |*theme(e'')|=3 & e''$<^k$e'} & *theme(e')=x & *dogs(x)

The truth-conditions can be read informally as follows: there is an eventuality e of bathing, whose cumulative agent is the girls and whose cumulative theme is the individual x such that (i)

there is a eventuality e' constituted of at least two sub-eventualities e", (ii) the sub-eventualities e" are such that their respective theme is of cardinality 3, and the k-trace of e" is a proper subpart of the k-trace of e', (iv) x is the theme of the plural eventuality e', (v) the referent of x is in the extension of *dogs*. I discuss in section 5.4 the prediction that the existential quantification over events in the denotation of the numeral phrase makes, and ignore it in this section.

The truth-conditions in (35c) are compatible with the distributive scenario in (14), schematized in (36), since there are indeed two states of being three, which are individuated by both their distinct dog referents and locations, and the theme of the sum of states of being three is indeed in the extension of the predicate *dogs*

(36) Participant (& spatial) distributive reading in (14)

Being 3	Theme	Location	Time
e_1	dog_1+dog_2+dog_3	tub_1	t_1
e_2	dog_4+dog_5+dog_6	tub_2	t_1

The truth-conditions in (35c) are also correctly predicted to be incompatible with the collective and cumulative scenarios schematized in (37a) and (37b): in both scenarios, there is only one state of being three whereas the truth conditions require there to be at least two.

(37) a. Collective context in (12)

Being 3	Theme	Location	Time
e_1	dog_1+dog_2+dog_3	tub_1	t_1

b. Cumulative context in (13)

Being 3	Theme	Location	Time
e_1	dog_1+dog_2+dog_3	tub_1+tub_2	t_1

Finally, remember that we identified that pluractional morphology marks the distributed share, thus the sentence in (15a), whose truth-conditions are derived in (38), is false in context (15a) where shares of two girls are distributed over each of the dogs. In my analysis, the truth-conditions are incompatible with the context (as schematized in (39)) because the truth-conditions require there to be at least two eventualities of being 3 dogs but the context provides only one such eventuality.

(38) Predicted truth-conditions for (15a)
Two girls bathed three.PLUR dogs
$[\![S]\!]^k$= $\exists$e. *bathe(e) & *agent(e)=ιx.$\exists$e'. |*theme(e')|=2 & *theme(e')=x & girls(x) & *theme(e)=ιy. $\exists$e".e"=$\cup${e"' | |*theme(e"')|=3 & e"' $<^k$ e"} & *theme(e")=y & *dogs(y)

(39) Distributive context in (15)

Being 2	Theme	Location	Time
e_1	$girl_1$+$girl_2$	tub_1	t_1
e_2	$girl_3$+$girl_4$	tub_2	t_1
e_3	$girl_5$+$girl_6$	tub_3	t_1
Being 3	Theme	Location	Time
e_5	dog_1+dog_2+dog_3	tub_1+tub_2+tub_3	t_1

However, if we take the same sentence except that the pluractional morphology is on the other

numeral in the sentence as in (15b), its truth-conditions (40) are satisfied by the context: there being just one eventuality of being 3 dogs is compatible with the truth-conditions, and crucially the truth-conditions require at least two eventualities of being two girls, which the context provides.

(40) Predicted truth-conditions for (15b)
Two.PLUR girls bathed three dogs
$[\![S]\!]^k$= ∃e. *bathe(e) & *agent(e)=ιx. ∃e'.e'=∪{e''| |*theme(e'')|=2 & e''$<^k$e'} & *theme(e')=x & *girls(x) & *theme(e)=ιy.∃e'''. |*theme(e''')|=3 & *theme(e''')=y & dogs(y)

Finally, consider the predicted truth-conditions of example (19) in (41).

(41) Predicted truth-conditions for (19)
My son caught three.PLUR fish.
$[\![S]\!]^k$= ∃e. *catch(e) & *agent(e)= my.son & *theme(e)=ιx. ∃e'.e'=∪{e''| |*theme(e'')|=3 & e''$<^k$e'} & *theme(e')=x & *fish(x)

These truth-conditions are verified in a scenario like the one schematized in (42) where the plurality of eventualities of being three fish covary with a plurality of fish species (as well as with a plurality of fish-referents).

(42) Schema of licensing context for (19)

Being 3	Theme	Species
e_1	$fish_1$+$fish_2$+$fish_3$	$species_1$
e_2	$fish_4$+$fish_5$+$fish_6$	$species_2$
e_3	$fish_7$+$fish_8$+$fish_9$	$species_3$
e_4	$fish_{10}$+$fish_{11}$+$fish_{12}$	$species_4$
e_5	$fish_{13}$+$fish_{14}$+$fish_{15}$	$species_5$
e_6	$fish_{16}$+$fish_{17}$+$fish_{18}$	$species_6$

5.4. Predictions of the analysis, puzzles and questions

The analysis I have presented here can be applied uniformly to numerals and other verbs in Seri to derive effects of distributive numerals and verbal pluractionality. This analysis though makes a number of testable predictions which further work needs to check.

In order to account for (i) the use of PLUR with both numerals and other verbs and, (ii) the freedom with which distributed shares denoted by pluractional numeral phrases can be individuated, I have deliberately given an analysis of PLUR with fairly weak truth-conditions. In fact the truth-conditions derived for sentences containing (nominalized) pluractional numeral phrases are made even weaker by the semantics of nominalization I have assumed: because nominalization of the sentence containing the numeral existentially closes off the event argument, the analysis presented in this paper predicts that a sentence containing a (nominalized) numeral phrase is true as long as there is/was some event of NP being (in groups of) *n* (where *n* stands for the quantity conveyed by the numeral). In other words, an example like (14b) is predicted to be true iff the girls bathed dogs collectively and at some point these dogs have been

in groups of three. Thus example (14b) is predicted to be true in the contexts in (43).[32]

(43) a. I have six dogs. Today two girls came to bathe them at 2pm. María and Alina together bathed them at the same time in the same tub. Yesterday, three of them fell in a whole, and the other three got stuck in an abandoned house.

b. I have six dogs. Today two girls came to bathe them at 2pm. They together bathed each dog one after the other. Then three dogs were put blue collars and the other three red collars.

Unfortunately, I do not have data yet checking these predictions. On the one hand, from the point of view of what is known on the interpretation of (distributive) numerals across languages, one does not expect this prediction to be correct. On the other hand, from the point of view of what is known on the interpretation of Seri nominalizations, one does expect this prediction to be correct! Indeed, the nominalization construction presented in section 5.1.2 and (6) does not apply just to numerals but to all verbs in Seri. Furthermore non-numeral verbs in this construction can be interpreted before the main predicate of the sentence. For example in (44a), the verb in the nominalized clause *iiquet com* 'her child' literally 'what she was pregnant with' must necessarily be interpreted at a time that precedes the main predicate *itexl* 'took'. In (44b), the temporal adverbs make it clear what the temporal sequence of events is.

(44) a. Cmaam cop iiquet com itexl,
woman DEF.SG 3POSS[OBJ.NMLZ]:pregnant_with DET 3SBJ:RLT:take
isaraapi quih an imfain.
3POSS:blanket DET [3POSS]in 3SBJ:RLMI:tie_up
'The woman took her child and wrapped him/her in his/her blanket.' (Marlett, 2016: 262)

b. Moxima ctam cmoqueepe quih cmaax quiipe ha.
yesterday man SBJ.NMLZ:be_sick DET now SBJ.NMLZ:good DCL
'The man who was sick yesterday is now well.'[33]

Given that (subject) nominalized constructions have the same overt structure whether the predicate is numeral or not, we may expect them to have the same interpretation. If not, then something covert must distinguish these two constructions (e.g. covert morphosyntax, interpretation principles).

The analysis makes other predictions which remain to be checked. It predicts that overlapping distributive keys should license pluractional numerals and that "messy/mix-and-match pluralities", i.e. a sortal key constituted of different types of units (participants, times, etc) should not license pluractional numerals in Seri[34]. Furthermore, future work should give a more thorough description of the syntactic distribution of pluractional numPs as well as of their interaction with quantifiers and other pluractional verbs.

[32]Thanks to Robert Henderson and Patricia Cabredo Hofherr for discussing this point with me.
[33]Steve Marlett, p.c.
[34]Thanks to Patricia Cabredo Hofherr for pointing this out to me.

6. Conclusion

This paper has provided a first detailed semantic examination of complex numerals in Seri. Morphologically, I have argued that Seri complex numerals are numerals marked for pluractionality. Semantically, I have argued that complex numerals are distributive numerals according to the definition in Cable (2014). Seri complex numeral phrases require the context to provide at least two eventualities witnessing the numeral predicate. These eventualities can be individuated by a variety of parameters: their location, their time, their participant, but also more specific parameters like book topics if book topic is relevant.

(complex) numeral phrases in Seri are nominalized clauses which contain an NP and a numeral verb. When PLUR combines with a predicate of eventualities V (including numerical ones), it returns a function from eventualities e to truth-values which yields true iff there is a plural eventuality e having at least two subeventualities e' which are in the denotation of V and which differ from one another along a contextually-determined parameter *k* (e.g. location, time). Thus Seri complex numerals are only distributive inasmuch as events are individuated by covarying with another dimension.

The analysis correctly predicts that, unlike numeral phrases in the scope of a universal quantifier, complex numeral phrases need not distribute over atoms in the key and the distribution needs not be exhaustive. The analysis also makes a number of so-far unchecked predictions. In particular, because (i) the analysis follows the overt morphosyntax of Seri very closely (i.e. nominalization) and (ii) the truth-conditions of PLUR are rather weak, the truth-conditions of sentences containing numeral phrases are very weak. Further research will check these predictions and adjust the analysis if needed.

References

Baerman, M. (2016). Seri verb classes: morphosyntactic motivation and morphological autonomy. *Language 92*(4), 792–823.

Balusu, R. (2006). Distributive reduplication in Telegu. In *Proceedings of NELS*, Volume 36, pp. 39.

Bosnić, A., J. Spenader, and H. Demirdache (2020). Dancing monkeys in Serbian and Korean–exhaustivity requirements on distributive share markers. *Glossa: a journal of general linguistics 5*(1).

Cable, S. (2014). Distributive numerals and distance distributivity in Tlingit (and beyond). *Language 90*(3), 562–606.

Cabredo Hofherr, P., J. Pasquereau, and C. O'Meara (2018). Event plurality in Seri. In K. Johnson and A. Göbel (Eds.), *Proceedings of the Tenth Conference on the Semantics of Underrepresented Languages in the Americas 10*, pp. 1–16.

Champollion, L. (2010). Quantification in event semantics. In *Talk given at the 6th International Symposium of Cognition, Logic and Communication*.

Champollion, L. (2016). Overt distributivity in algebraic event semantics. *Semantics and Pragmatics 9*, 1–65.

Choe, J.-W. (1987). *Anti-quantifiers and a theory of distributivity*. Ph. D. thesis, University of Massachusetts.

Dressler, W. (1968). *Studien zur verbalen Pluralität*. Österreichische Akademie der Wissenschaften. Wien: Bühlau in Kommission.

Farkas, D. F. (1997). Dependent indefinites. In A. Szabolcsi (Ed.), *Empirical issues in formal syntax and semantics*, Dordrecht. Citeseer: Kluwer.

Gil, D. (1982). *Distributive numerals*. Ph. D. thesis, UCLA.

Gordon, L. (1986). *Maricopa morphology and syntax*, Volume 108. Univ of California Press.

Henderson, R., J. Pasquereau, and J. Powell (2020). Pluractionality and distributivity on the edge of Mesoamerica. Handout of a talk given at the Workshop on the Languages of Meso-America, University of California Santa Cruz, US.

Henderson, R. M. (2012). *Ways of pluralizing events*. Ph. D. thesis, UC Santa Cruz.

Knežević, N. (2015). *Numerals and distributivity in Serbian: at the syntax-semantics-acquisition interface*. Ph. D. thesis, Nantes.

Knežević, N. and H. Demirdache (2018). Universal quantification and distributive marking in Serbian. In *Linguistic and Cognitive Aspects of Quantification*, pp. 115–140. Springer.

Kratzer, A. and I. Heim (1998). *Semantics in generative grammar*, Volume 1185. Blackwell Oxford.

Krifka, M. (1992). Thematic relations as links between nominal reference and temporal constitution. In I. A. Sag and A. Szabolcsi (Eds.), *Lexical Matters*, pp. 29–53. Stanford, CA: CSLI Publications.

Kuhn, J. (2020). Gather/numerous as a mass/count opposition. *Natural Language Semantics*, 1–29.

Lasersohn, P. (1995). Pluractional markers. In *Plurality, Conjunction and Events*, pp. 238–266. Springer.

Marlett, S. (2012). Relative clauses in Seri. *Relative clauses in languages of the Americas: A typological overview 102*, 213.

Marlett, S. A. (2016). Cmiique Iitom: the Seri language. Unpublished grammar (2016 draft).

Mellesmoen, G., H. Davis, and L. Matthewson (2020). Decomposing distributive numerals in ʔayʔaǰuθəm (Comox-Sliammon Salish). In *Proceedings of Sinn und Bedeutung*, Volume 24, pp. 72–89.

Moser, E. (1961). Number in Seri verbs. Master's thesis, University of Pennsylvania.

Newman, P. (1980). *The classification of Chadic within Afroasiatic*. Universitaire Pers.

Oh, S.-R. (2006). *Plurality markers across languages*. Ph. D. thesis, University of Connecticut.

Pasquereau, J. and P. Cabredo Hofherr (2020). Eventuality individuation through the prism of pluractionality in Seri. manuscript.

Pasquereau, J. and P. Cabredo Hofherr (2021). Two types of pluractionality in Seri. In K. Johnson and A. Göbel (Eds.), *Proceedings of the Eleventh Conference on the Semantics of Underrepresented Languages in the Americas 11*, pp. 1–16.

Toosarvandani, M. (2014). Two types of deverbal nominalization in Northern Paiute. *Language 90*(4), 786–833.

Wellwood, A. (2015). On the semantics of comparison across categories. *Linguistics and Philosophy 38*(1), 67–101.

Xrakovskij, V. S. (1989). *Tipologia iterativnyx konstruktsiy*. Leningrad: Nauka.

Xrakovskij, V. S. (1997). *Typology of iterative constructions*. München: Lincom Europa.