Numeral constructions with classifiers in Sixteenth-Century Central Nahuatl*

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1. Introduction

In this paper, I focus on the syntax and semantics of numeral constructions with classifiers in Sixteenth-century Central Nahuatl (Uto-Aztecan), such as the one shown in (1), in which there is a numeral, *cen*, a classifier, *-te-*, and a noun, *nocahuallô*. Henceforth, I will refer to Sixteenth-century Central Nahuatl as CN.

(1) nicpia **centetl nocahuallô** machô
nicpia cen-te-tl no-cahuallô machô
I have it one-CL-GN POSSR.1-horse male
'I have a male horse'
(Cline and Portilla 1984:154, doc.44, f.70v)[1]

There are two main approaches to the constituency and semantics of numeral constructions with classifiers. According to the first approach, a noun combines first with a classifier and the classifier-noun sequence then combines with a numeral (2a). Regarding the semantics of numeral constructions with classifiers, under the first approach, the presence of a classifier is a requirement of the noun, since it needs the presence of a classifier to combine with a numeral. A classifier is a function that takes an NP predicate as its argument and returns the set of atoms of that predicate. The resulting CL-N expression then combines with a numeral to denote the set of individuals made of the atoms of that predicate and that have *n* atomic parts. As shown in (2b), a NUML-CL-N expression denotes the set of individuals *x* such that, for every *x*, there is a partition S on it whose cardinality is equal to the number *n* conveyed by the numeral and every member of which is an atom in the

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[1] CL = classifier; DET = determiner; GN = general number; N = noun; NP = noun phrase; NUML = numeral; PART = particle; PL = plural; POSS = possessee; POSSR = possessor; UNPOSS = unpossessed; 1 = first person; 3 = third person.

denotation of the NP. In (2b), AT is the set of atoms in the domain from which nouns take their denotation.

(2) First approach (Chierchia 1998)

a. [[NUML] [CL NP]]

b. $[\![\text{CL}]\!] = \lambda \text{P}.\lambda x.\text{AT}(x)\ \&\ \text{P}(x)$
$[\![\text{NP}]\!] = \lambda x.\text{PREDICATE}_{\text{NP}}(x)$
$[\![\text{CL NP}]\!] = \lambda x.\text{AT}(x)\ \&\ \text{PREDICATE}_{\text{NP}}(x)$
$[\![\text{NUML}]\!] = \lambda \text{P}.\lambda x.\exists \text{S}[\Pi(\text{S})(x)\ \&\ |\text{S}|{=}n\ \&\ \forall s \in \text{S}\ \text{P}(s)]$ (Ionin and Matushansky 2006)
$[\![\text{NUML CL NP}]\!] = \lambda x.\exists \text{S}[\Pi(\text{S})(x)\ \&\ |\text{S}|{=}n\ \&\ \forall s \in \text{S}[\text{AT}(s)\ \&\ \text{PREDICATE}_{\text{NP}}(s)]]$

In the second approach, a classifier combines first with a numeral and the numeral-classifier complex then combines with a noun (3a). Under this approach, numerals require the occurrence of a classifier to modify a noun. As shown in (3b), classifiers are functions that relate an NP denotation with a numerical value. Classifiers specify a measure function that stipulates that an individual x is to be measured in terms of the number of atoms x contains. In (3b), ATOM is a measure function that takes an individual x as its argument and returns the number n of atoms that individual is made of. Thus, according to the second approach, a numeral construction with a classifier denotes the set of individuals that are members of the set defined by an NP predicate and that have n atomic parts.

(3) Second approach (Krifka 1989, 1995, Wilhelm 2008)

a. [[NUML CL] [NP]]

b. $[\![\text{CL}]\!] = \lambda n.\lambda \text{P}.\lambda x.\text{P}(x)\ \&\ \text{ATOM}(x) = n$
$[\![\text{NUML}]\!] = n$
$[\![\text{NUML CL}]\!] = \lambda \text{P}.\lambda x.\text{P}(x)\ \&\ \text{ATOM}(x) = n$
$[\![\text{NP}]\!] = \lambda x.\text{PREDICATE}_{\text{NP}}(x)$
$[\![\text{NUML CL NP}]\!] = \lambda x.\text{PREDICATE}_{\text{NP}}(x)\ \&\ \text{ATOM}(x) = n$

In this paper, I argue that, in CN, numeral constructions with a classifier have the syntax and semantics advocated for by the second approach. In the following sections, to determine the constituency structure of CN numeral constructions in which a classifier occurs, I apply five different diagnostics to them. I conclude that there are three pieces of evidence that support the claim that, in CN, the syntactic structure of numeral constructions with a classifier is the one shown in (3a). First, in CN, numerals and classifiers constitute a single word (Gil 1994). Second, in CN, a NUML-CL sequence may be non-adjacent to the noun with which that NUML-CL sequence combines (Bale et al. 2019). By contrast, CL-N sequences non-adjacent to the numeral are not attested. Last, in CN, NUML-CL sequences may occur even in the absence of a noun, whereas there are no attested cases in which a CL-N sequence occurs in the absence of a numeral (Little et al. 2020). I further claim that, since, in CN, numeral constructions with a classifier seem to have the syntactic structure

given in (3a), it is more plausible to assign them the semantics put forward by the second approach mentioned here (3b).

2. Classifiers and numerals constitute a single word

In CN, classifiers and numerals constitute a single word, as suggested by certain morphonological phenomena. For instance, when the numeral *nāhui* 'four' occurs bound to a classifier, its final vowel disappears (4a). The same happens whenever *nāhui* combines with another root to form a compound (4b). Note that, if *nāhui* occurs as a free morpheme, its final vowel is not elided (4c). I claim that the numeral and the classifier being a single word fits better under the second approach (Gil 1994).

(4) a. nāuhtetl cahuallos
nāuh-te-tl cahuallos
four-CL-GN horses
'four horses'
(de Sahagún 1993:216,218, fol.67-67v)

b. nāuhtēcutli
nāuh-tēcu-tli
four-lord-GN
'four lords'
(de Sahagún 1993:222, fol.69v)

c. nāhui īmīuh
nāhui ī-mī-uh
four POSSR.3-arrow-POSS.GN
'his four arrows'
(de Sahagún 1993:130, fol.31)

Regarding the facts discussed in the previous paragraph, Borer (2005) considers that the one-word properties that NUML-CL sequences seem to display in many languages are compatible with the first approach previously mentioned. Borer claims that in numeral constructions a noun's denotation must be portioned out to be counted. The portioning out of a noun's denotation may be accomplished by means of either a classifier or plural morphology. According to Borer, classifiers and plural morphology are in complementary distribution, and, for this reason, these two elements must occur in the same syntactic position. Borer claims that both classifiers and plural morphology occur as heads of the same phrase, the Classifier Phrase (CLP). It is only in that position that classifiers and plural morphology can portion out a noun's denotation. Given that both classifiers and plural morphology may head CLP, in counting constructions this phrase must be headed by one of these elements (but not by both at the same time) (5). These two options are represented in (5). Whereas in (5a) the classifier occurs as the head of the CLP, in (5b), the noun moves to the head of CLP to receive plural inflection.

(5) a. [$_{\#P}$ NUML [$_{CLP}$ CL [$_{NP}$ N]]]
b. [$_{\#P}$ NUML [$_{CLP}$ N$_{[+PL]}$ [$_{NP}$ ~~N~~]]]

Notice that, in (5), classifiers first combine with an NP and then with a numeral, which occurs inside a phrase labeled by Borer as Quantity Phrase (#P). Thus, Borer's proposal is compatible with the first approach mentioned above. To account for the fact that in some languages NUML-CL sequences behave like a single word, Borer suggests that a classifier moves from the head of CLP to the head of #P (6). According to Borer, this movement is the only way to account for the one-word behavior of NUML-CL sequences, for a classifier must occur as the head of CLP to portion out a noun's denotation.

(6) [$_{\#P}$ NUML [CL [$_{CLP}$ ~~CL~~ [$_{NP}$ N]]]]

However, I argue that Borer's proposal does not fit well with the CN data, for, as shown in (7), in CN classifiers and plural nouns may co-occur, which is not predicted by Borer's theory. In (7), a classifier, *-te-*, and a plural NP, *tōtōlmê cuānacamê*, coappear.

(7) **chicōnt<u>e</u>mê tōtōlmê cuānacamê** monamacazquê
chicōn-te-mê tōtōl-mê cuānaca-mê monamacazquê
seven-CL-PL bird-UNPOSS.PL crest-UNPOSS.PL will be sold
'and seven hens will be sold'
(Cline and Portilla 1984:126, doc.38, f.64r)

In cases such as (7), the one-word properties displayed by the NUML-CL sequence cannot be accounted for by a movement of the classifier from the head of CLP to the head of #P, since the former would be already occupied by a plural noun. Moreover, if CLP is already headed by an element other than the classifier, the noun's denotation is already portioned out by that other element, and the classifier is no longer required to occur as the head of CLP. Thus, resorting to movement to explain the one-word properties that NUML-CL sequences show in CN is no longer necessary.

In sum, Borer's proposal does not explain the CN data, and, therefore, under the first approach mentioned above, the fact that, in CN, NUML-CL sequences constitute a single word remains to be explained. By contrast, in the second approach, the numeral and the classifier of a numeral construction behaving as a single word is straightforwardly accounted for.

3. Numl-Cl sequences may be non-adjacent to a noun

In the first approach mentioned here, given that classifiers and nouns form a single constituent, a CL-N sequence may be moved, and therefore might appear in a position that is non-adjacent to a numeral. On the other hand, under the second approach, NUML-CL sequences non-adjacent to a noun are expected to be possible to occur since a numeral and a classifier make up a constituent without a noun, and, thus, a NUML-CL sequence might undergo movement (Bale et al. 2019). As predicted by the second approach, in CN,

NUML-CL sequences non-adjacent to a noun are attested, as shown in (8), in which the NUML-CL sequence, *centetl*, is non-adjacent to the noun, *tōtōtl*.

(8) **centetl**$_{i}$ càciquê [t_{i} **tōtōtl nextic**]
cen-te-tl càciquê tōtō-tl nextic
one-CL-GN they caught it bird-UNPOSS.GN brown
'(The water-people) caught a brown bird'
(de Sahagún 1993:54, fol.2v)

According to Andrews (2003), in cases such as (8), the NUML-CL sequence moves to the left periphery of the sentence, where it receives a topic reading. It is worth mentioning that other constituents also move to the left periphery in order to be topicalized. For instance, in (9), the possessor, *In cocoxqui*, is fronted, and therefore it is interpreted as the topic of the sentence.

(9) **In cocoxqui**$_{i}$ ōhuetz [t_{i} **in īitozqui**]
In cocoxqui ōhuetz in īi-tozqui
DET sick person fell DET POSSR.3-voice
'As for the sick man, his voice failed'
(Andrews 2003:145)

4. Coordinated sequences

Under the first approach, sequences of coordinated numerals are expected to follow a [NUML+NUML]-CL-(N) pattern since, in this approach, classifiers and nouns are part of a constituent that does not include a numeral and hence it is not possible to coordinate NUML-CL sequences in which a noun is not present. On the other hand, if, as predicted by the second approach considered here, numerals and classifiers constitute a single constituent that does not include a noun, NUML-CL sequences may be coordinated, and, thus, [NUML-CL+NUML-CL]-(N) sequences might occur (Bale et al. 2019). The second approach correctly predicts the existence of [NUML-CL+NUML-CL]-(N) sequences in CN, as shown in (10), in which the classifier *-te-* occurs inside the complex numeral *cenpōhualtetl īpan v tetl*.

(10) [cenpōhual**tetl** īpan v **tetl**] cacahuatl
cen-pōhual-te-tl īi-pan màcuīil-te-tl cacahua-tl
one-twenty-CL-GN POSSR.3-on five-CL-GN cocoa-UNPOSS.GN
'25 cocoa beans'
(Cline and Portilla 1984:42, doc.13, f.35r)

Nonetheless, note that, in CN numeral constructions, the noun may appear in the first conjunct of a complex numeral. For instance, in (11) the noun *tlācatl* occurs inside the first conjunct of a complex numeral.

(11) [[caxtōlli **tlācatl**] onāhui]
caxtōl-li tlāca-tl on-nāhui
fifteen-GN man/person-UNPOSS.GN plus-four
'nineteen people'
(Anderson et al. 1976:110)

Given that, in CN, a noun may occur inside the first conjunct of a sequence of coordinated numerals, it cannot be ruled out that, in cases such as (10), there is a non-overtly realized noun in the first conjunct. Consequently, examples like (10) could be analyzed as numeral constructions of the [NUML-CL-(N)]+[NUML-CL-N] type, which are compatible with either the first or the second approach. Thus, the existence of NUML-CL+NUML-CL-(N) sequences does not prove by itself that, in CN, the syntactic structure of numeral constructions with classifiers is the one put forth in the first approach mentioned above.

5. Classifiers and nouns may not co-appear

In CN, a NUML-CL sequence may occur in the absence of a noun. According to the first approach, CL-N sequences might occur in contexts in which no numeral is present, since the occurrence of a classifier is a requirement of the noun, and therefore the appearance of a numeral is not needed for a classifier to occur. In the second approach, NUML-CL sequences might occur in contexts in which no noun is present, for it is not the noun but the numeral that demands the overt appearance of a classifier (Little et al. 2020). The second approach correctly predicts the existence of those CN cases in which a numeral co-occurs with a classifier and there is not a noun present, as illustrated in (12). In (12) the presence of a noun is not necessary for a NUML-CL sequence, *ētlamantli*, to occur.

(12) In ic **ētlamantli** niquìtoā in nèhuātl diego sanchez...
in ic ē-tlaman-tli niquìtoā in nèhuātl diego sanchez
DET PART three-CL-GN I say it DET I Diego Sánchez
'Third, I, Diego Sánchez, say that...'
(Cline and Portilla 1984:214, doc.60, f.88r)

It is important to stress that, in cases like (12), the presence of a non-overtly realized noun is not possible to be inferred from the context. In fact, in CN, a classifier always co-occurs with a numeral (or with the quantifiers *quēzqui* 'how many' and *īzqui* 'however many'), and there are no attested cases in which a classifier solely co-occurs with a noun.

6. Idiosyncratic behavior

If the first approach is correct, there might be nouns that require the presence of a classifier to combine with a numeral and nouns that do not. This is due to the fact that, in the first approach considered here, the element that demands the presence of a classifier is the noun (Simpson and Ngo 2018). On the other hand, if the second approach is the correct one, some numerals might need the presence of a classifier to modify a noun, but others might

not, for, under the second approach, the element that determines the presence of a classifier is the numeral (Bale and Coon 2014).

There are two reasons why it is not possible to apply this diagnostic to the CN data. First, given that there is only positive evidence available, it is not possible to determine whether in any given numeral construction the appearance or absence of a classifier is mandatory or optional. For instance, in (13a), the absence of a classifier may be optional. Likewise, in (13b) the appearance of the classifier *-te-* may not be mandatory. Furthermore, note that, because it is impossible to establish if the appearance or absence of a classifier is optional or mandatory, there is no way to ascertain if in CN there are numerals or nouns that require the presence of a classifier or not. Keep in mind that the fact that a noun or a numeral always co-occurs with a classifier does not mean that they require the presence of a classifier. Likewise, the fact that a noun or a numeral is never attested along with a classifier does not mean that they do not allow the presence of a classifier.

(13) a. cē cuāuhtli
cē cuāuh-tli
one eagle-UNPOSS.GN
'one eagle (warrior)'
(de Sahagún 1993:p.234, fol.75v)

b. ōntetl cuāuhtli
ōn-te-tl cuāuh-tli
two-CL-GN eagle-UNPOSS.GN
'two eagle (warriors)'
(de Sahagún 1993:234,fol.75v)

Second, at least in some cases, the overt appearance of a classifier in CN does seem to be optional (14). For instance, while in (14a) the classifier *-te-* does occur, in (14b) it does not. In (14a) appears the same numeral (*cē* '1') and the same noun (*ācalli* 'boat') as in (14b). Thus, the context in both of the examples shown in (14) seems to be the same. The fact that, in CN, the overt appearance of a classifier appears to be optional suggests that, in CN, neither nouns nor numerals require the presence of a classifier. However, the lack of negative evidence prevents me from stating a more robust generalization. Notice that, also due to the unavailability of negative evidence, the optional character of a classifier cannot be attributed to either the noun or to the numeral.

(14) a. zan **centetl in ācalli**
zan cen-te-tl in ācal-li
only one-CL-GN DET boat-UNPOSS.GN
'there was only one boat'
(de Sahagún 1993:56, fol.3v)

b. niman ye ic **cē** huīitz **in ācalli**
niman ye ic cē huīitz in ācal-li
then already PART one come DET boat-UNPOSS.GN
'then, for that reason, came one boat'
(de Sahagún 1993:234, fol.75)

In sum, both the fact that there is only positive evidence and the fact that in CN the overt appearance of a classifier seems to be optional render impossible to establish if in CN there are nouns or numerals that display an idiosyncratic behavior with respect to whether they require the presence of a classifier or not.

7. Conclusions

In conclusion, of the five diagnostics considered in this paper, only three of them were useful to determine the constituency structure of CN numeral constructions in which a classifier occurs. First, in CN, NUML-CL sequences seem to behave as a single word. Second, in CN, NUML-CL sequences may appear in a non-adjacent position to a noun. By contrast, CL-N sequences non-adjacent to a numeral are not attested. Third, whereas the presence of a numeral seems to be necessary for a classifier to occur, the occurrence of a noun is not. These three diagnostics suggest that, in CN, a classifier first combines with a numeral and then with a noun, and that, therefore, the second approach correctly predicts the syntactic behavior of those CN numeral constructions in which a classifier occurs. Furthermore, I conclude that, given that in CN a classifier and a numeral seem to form a constituent that does not include a noun, their semantics must be the one put forth under the second approach, and, consequently, in CN, classifiers are functions that relate a noun denotation with a numerical value. Thus, the syntactic structure and the semantics of (1) are presented in (15a) and (15b), respectively.

(15) a. [[centetl] [nocahuallô machô]]

b. $[\![$-te-$]\!] = \lambda n.\lambda \text{P}.\lambda x.\text{P}(x)$ & $\text{ATOM}(x) = n$
$[\![$cen$]\!] = 1$
$[\![$centetl$]\!] = \lambda \text{P}.\lambda x.\text{P}(x)$ & $\text{ATOM}(x) = 1$
$[\![$nocahuallô machô$]\!] = \lambda x.\text{NOCAHUALLÔ MACHÔ}(x)$
$[\![$centetl nocahuallô machô$]\!] = \lambda x.\text{NOCAHUALLÔ MACHÔ}(x)$ & $\text{ATOM}(x) = 1$

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