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# Distance Distributivity and Pluractionality in Tlingit (and Beyond)

**1. Introduction** Based upon original data gathered from fieldwork, this paper develops a formal semantic analysis for distributive numerals in Tlingit, a highly endangered language of Alaska. Such numerals enforce a distributive reading of the sentence, and thus are one instance of the broader phenomenon of 'distance distributivity' (Zimmermann 2002). I show that this semantics also provides fruitful analyses of distance distributivity in other languages. It can account for certain locality effects noted for distance distributives in Korean and German (Zimmermann 2002, Oh 2005), as well as an intriguing puzzle regarding distributive numerals and pluractionality in Kaqchikel (Henderson 2011). Finally, I show how the analysis can be extended to the well-known case of English 'binominal each'.

**2. Distributive Numerals in Tlingit** When a numeral in Tlingit bears the 'distributive' suffix *–g̲aa*, the resulting expression has all the hallmarks of a 'distributive numeral' (Gil 1982, Choe 1987, Oh 2005, Balusu 2006, Henderson 2011). As shown below, unlike unmarked numerals (1), distributive numerals in Tlingit do not permit 'collective' or 'cumulative' readings, only distributive ones (2).

(1) Ax̲ k̲aa yátx'i [ **nás'k** x̲áat ] has aawasháat.
my male children **three** fish 3plS.3O.caught
'My sons caught three fish.' (Cumulative or Collective Reading OK)

(2) Ax̲ k̲aa yátx'i [ **nás'gigáa** x̲áat ] has aawasháat.
my male children **three.DIST** fish 3plS.3O.caught
(i) 'My sons caught three fish each', OR (ii) 'My sons caught three fish each time'

Furthermore, as the dual translations under (2) suggest, Tlingit sentences containing distributive numerals seem at first to be ambiguous. As in many languages with distributive numerals, such sentences can describe two distinct kinds of distributive scenarios: (i) a 'participant-distributive' scenario where the distribution is over some plural entity (three fish to each son), and (ii) an 'event-distributive' scenario where the distribution is over some plural event (three fish to each catching event) (Gil 1982, Choe 1987, Zimmermann 2002, Oh 2005, Balusu 2006).

Despite this apparent ambiguity, I put forth a univocal semantics for Tlingit distributive numerals. Under this analysis, sentences like (2) are not truly ambiguous, but simply have rather broad truth-conditions, which hold both in participant-distributive and event-distributive scenarios. The analysis is shown to predict a variety of further, more subtle features of distributive numerals in Tlingit, including the fact that the apparent ambiguity in (2) does not hold for all sentences; some structures containing distributive numerals are true only in event-distributive scenarios (3).

(3) **Dáx̲gaanáx̲** shaax'wsáani **nás'gigáa** keitl has aawashúch.
**two.DIST** girls **three.DIST** dog 3plS.3O.bathed
'Each time, two girls bathed three dogs'. [No other interpretation possible]

**3. Formal Semantic Analysis** The proposed semantics assumes the general framework presented in Kratzer 2008. All natural language predicates are assumed to be cumulative, (4). As in related work, I mark metalanguage predicates with an asterisk '*', simply as mnemonic indicating their cumulativity.

(4) If P is a lexical item of natural language, then if $[[P]](x_1)\ldots(x_n) = T$, and $[[P]](y_1)\ldots(y_2) = T$, then $[[P]](x_1+y_1)\ldots(x_n+y_n) = T$

As in much work, lexical verbs are cumulative relations between events and entities (5a), as is the little-*v* functional head (5b). Thus, a sentence like (1) with a plain numeral will have the LF in (6a) and therefore the truth-conditions in (6b), which hold in either collective or cumulative scenarios.

(5) a. [[catch / has aawasháat ]] = $[\ \lambda x_e : \lambda e_\varepsilon : \text{*catch}(e)\ \&\ \text{*Theme}(e) = x\ ]$
b. [[ *v* ]] = $[\ \lambda x_e : \lambda e_\varepsilon : \text{*Agent}(e) = x\ ]$

(6) a. $[_S\ \exists e\ [_{vP}\ [_{DP}$ Ax̲ k̲aa yátx'i $]\ [_{vP}\ v\ [_{VP}\ [_{DP}$ **nás'k** x̲áat $]$ has aawasháat $]\ \ldots\ ]$
b. $\exists e\ .\ \exists x\ .\ \text{*fish}(x)\ \&\ |x| = 3\ \&\ \text{*caught}(e)\ \&\ \text{*Agent}(e) = \sigma_x.\text{*my.son}(x)\ \&\ \text{*Theme}(e) = x$

In addition to these common assumptions, I will introduce the metalanguage predicate 'Participant' (7a), as well as a special version of the maximality operator 'σ', which applies to pairs (7b).

(7) a. Participant(e,*x*) *iff* x bears a 'theta relation' to e (*i.e.*, x is Agent / Theme / Goal of e)

b. $\sigma_{<x,y>} . Q(x)(y) =_{df}$ the pair $<\alpha,\beta>$ such that $<\alpha,\beta> \in *\{<x,y> : Q(x)(y)\}$, and if $<\gamma,\delta> \in *\{<x,y> : Q(x)(y)\}$, then $\gamma \leq \alpha$, and $\delta \leq \beta$

With these ingredients in place, the proposed semantics for Tlingit *–g̲aa* is as in (8).

(8) $[[\text{ gaa }]] = [\ \lambda n_n : [\ \lambda Q_{<et>} : [\ \lambda P_{<e,\varepsilon t>} : [\ \lambda e_\varepsilon : \exists x.\ Q(x)\ \&\ P(x)(e)\ \&$
$<e , x> = \sigma_{<e',y>} .\ y < x\ \&\ |y| = n\ \&\ e' < e\ \&\ \text{Participant}(e',y)\ ]\ \ldots ]$

This semantics will derive the truth-conditions in (9b) for the LF in (9a).

(9) a. $[_S\ \exists e\ [_{vP}\ [_{DP}$ Ax̲ k̲aa yátx'i ] $[_{vP}$ *v* $[_{VP}\ [_{DP}$ **nás'gigáa** x̲áat ] has aawasháat ] … ]

b. $\exists e\ .\ \exists x\ .\ {*fish}(x)\ \&\ {*caught}(e)\ \&\ {*Agent}(e) = \sigma_x.{*my.son}(x)\ \&\ {*Theme}(e) = x\ \&$
$<e , x> = \sigma_{<e',y>} .\ y < x\ \&\ |y| = 3\ \&\ e' < e\ \&\ \text{Participant}(e',y)$

Thee formula in (9b) can be read informally as: there is a (plural) event e of my sons (cumulatively) catching some fish 'x', and 'x' can be divided up into triplets, each of which participated in some subevent of e. Consequently, (9b) holds in participant-distributive scenarios where each son catches three fish, as well as event-distributive scenarios where there are many events of my sons catching three fish. Importantly, while (2) is predicted to have this semantic flexibility, other sentences are not. For example, (3) will have the truth-conditions in (10), which only hold in event-distributive scenarios containing many events of two girls bathing three dogs.

(10) $\exists e\ .\ \exists x\ .\ {*girl}(x)\ \&\ \exists z\ .\ {*dog}(z)\ \&\ {*bathe}(e)\ \&\ {*Agent}(e) = x\ \&\ {*Theme}(e) = z\ \&$
$<e , x> = \sigma_{<e',y>} .\ y < x\ \&\ |y| = 2\ \&\ e' < e\ \&\ \text{Participant}(e',y)\ \&$
$<e , z> = \sigma_{<e',y>} .\ y < z\ \&\ |y| = 3\ \&\ e' < e\ \&\ \text{Participant}(e',y)$

**4. Application to Other Languages** Distributive numerals in Korean appear to be subject to an interesting locality condition (Choe 1987, Oh 2005): sentences containing distributive numerals in subordinate clauses (11) do not permit readings where the distribution is over a participant in the matrix clause (12). Similar facts have also been reported for German (Zimmermann 2002).

(11) Chemwentuli [ aituli phwungsen-hana-**ssik**-ul saessta ] malhaessta
store.clerks children balloon-one-**DIST-ACC** bought said
'The store clerks said that the children bought one balloon each / each time.'

(12) Not a Reading of (11): 'Each store clerk said that the kids bought one balloon'

If the suffix *ssik* is given the semantics in (8), these facts follow. The truth-conditions predicted for (11) will not hold in (12). Furthermore, QR of *phwungsen-hana-**ssik**-ul* into the matrix clause will yield a 'de re' reading that is not compatible with (12) (and will violate clause-boundedness of QR). In addition to the facts in (11)-(12), the semantics in (8) predicts an interesting interaction between distributive numerals and pluractional verbal suffixes in the Mayan language Kaqchikel (Henderson 2011).

**5. Extension to English Binominal Each** As is well-known, English binomional each (14a) differs from distributive numerals in that it cannot describe event-distributive scenarios (14c).

(14) a. My sons caught [ three fish **each** ]

b. Verifying Scenario: Each son catches three fish.

c. Not a Verifying Scenario: My sons (together) catch three fish each time.

A small change to our semantics in (8) will produce exactly this result. Following Zimermann (2002), English binominal each contains a null pronoun, which must be bound (15a). Binominal *each* takes the referent of this pronoun as argument, but is otherwise identical to *g̲aa* (15b).

(15) a. Underlying Structure of Binominal Each: [ [ three [ each $pro_i$ ] ] fish ]

b. $[[\text{ each}_{binom}\ ]] = [\ \lambda z_e : [\ \lambda n_n : [\ \lambda Q_{<et>} : [\ \lambda P_{<e,\varepsilon t>} : [\ \lambda e_\varepsilon : \exists x.\ Q(x)\ \&\ P(x)(e)\ \&$
$<e , x> = \sigma_{<e',y>} .\ y < x\ \&\ |y| = n\ \&\ e' < e\ \&\ \text{Participant}(e',y)\ \&$
$<e , z> = \sigma_{<e',y>} .\ y < z\ \&\ |y| = 1\ \&\ e' < e\ \&\ \text{Participant}(e',y)\ ]\ \ldots]$

This semantics predicts that (14a) will be true *iff* there is a (plural) event of my sons catching some fish, and the fish can be divided up into triplets that participated in some subevent of the catching, and my sons can be divided into *atoms* that participated in some such subevent. Thus, (14a) will be true in a scenario like (14b), but not one like (14c).