Abstract

In this paper we outline some major empirical results and theoretical developments which have emerged from the study of quantification in North American languages, focusing on nominal quantification. We find that weak quantifiers can function as cardinality predicats, but can also be interpreted as DP-internal proportional quantifiers. Strong quantifiers are often, but not always, expressed as A-quantifiers (e.g., as adverbials). North American languages generally lack quantificational determiners (quantificational elements in D position), which raises the issue of whether they also lack generalized quantifiers (GQs); among the languages in which the relevant semantic tests have been done, Passamaquoddy, Gitksan, and Kwak’wala all appear to have GQs, while St’át’imcets (Lillooet Salish) appears to lack them.

Quantification

Henry Davis and Lisa Matthewson

1 Introduction

1.1 Overview

North American languages have played a pivotal role in the history of cross-linguistic work on quantification and in the development of quantificational theory. In this chapter we outline the major empirical results and theoretical developments involving quantification in North American languages. We restrict our attention to the nominal domain, for reasons of space and because this reflects the focus of most of the literature. A large part of our discussion is devoted to the debate concerning the existence of generalized quantifiers and of the elements which create them (‘D-quantifiers’).

In the remainder of the introduction we provide a brief theoretical background on quantification. In section 2 we provide some historical perspective, focusing on the debate over Barwise and Cooper’s (1981) NP-Quantifier Universal. Section 3 breaks down this debate into a series of empirical hypotheses, and surveys evidence for and against each one in North American languages.

1.2 Theoretical background

Quantification in the nominal domain is illustrated in (1) for English.

(1) a. All humans are mortal.
    b. Every student passed the exam.
    c. Josie ate most of the cupcakes.

The standard view of quantification which emerged in the formal semantic literature in the 1980s can be summarized as follows (simplifying for the purposes of exposition). Common noun phrases (‘CNPs’, for example humans) and verb phrases (like are mortal) denote sets of individuals. Quantifiers like all denote relations between those two sets. For example, the universal quantifier all denotes a subset relation, so (1)a is true if and only if the set of humans is
a subset of the set of mortal individuals. This is schematized informally for the general case in (2). Following Partee (1991), Bach et al. (1995) we call noun-phase internal quantifiers like \textit{all} ‘D-quantifiers’.

(2) \textquote{all CNP VP} is true if and only if CNP \subseteq VP

Although the D-quantifier semantically relates the CNP and the VP, syntactically it forms a constituent with its CNP sister. (For example in (1a), \textit{all} semantically relates the set of humans to the set of beings who are mortal, but it forms a syntactic constituent only with \textit{humans}.) Under the assumption that semantic composition reflects syntactic constituency (the Principle of Compositionality), the D-quantifier must take the CNP as its first argument; the entire quantified noun phrase then denotes a function from VP-denotations (sets) to truth values. Quantified noun phrases with these denotations, like \textit{all humans}, denote generalized quantifiers; an example is given in (3). See Szabolcsi (2010: Chapter 1 and references therein) for a useful introduction to generalized quantifiers.

(3) a. The generalized quantifier \textquote{all CNP} denotes that function which takes a VP and returns a proposition which is true if and only if CNP \subseteq VP.
   
b. more formally: [[all P]] = \lambda Q. P \subseteq Q


(4) a. Bill always eats pancakes for breakfast.
   
b. I’m usually at home on Saturdays.

Here we concentrate exclusively on D-quantification: this reflects the primary focus of the literature, both in general and in North American languages. For targeted discussion of quantification in the verbal domain in North American languages, see among others van Geenhoven (2004), Bittner and Trondhjem (2008).

Another important division within the set of quantifiers is the strong-weak distinction. Weak quantifiers, otherwise known as cardinal, intersective, or existential, are defined as follows by Keenan (2012:2):

(5) For a quantifier Q and sets A,B, Q(A)(B) is determined by A\cap B, the set of As that are Bs.

For example, \textit{some}, \textit{no} and \textit{three} are intersective because the truth of \textit{some/no/three}(A)(B) depends solely on the size of A\cap B (the set of As that are also Bs must have a cardinality of above zero, zero or three, respectively). This result can be achieved by assigning the quantificational word itself the semantics of a simple cardinality predicate (e.g., Partee 1988). Under such an analysis, intersective quantifiers like \textit{some/no/three} do not actually form generalized quantifiers (functions from CNP-denotations to truth values). Instead, they denote predicates which pick out sets of individuals of a certain size.
Following Milsark (1974) and others, a standard diagnostic for weak quantifiers is that they are acceptable in existential (there-insertion) contexts, as in (6).

(6) There are some/no/three hedgehogs in the garden.

In many North American languages intersective quantifiers may function syntactically as main predicates. This is shown for St’át’imcets (a.k.a. Lillooet, Northern Interior Salish) in (7) and for Kwak’wala (Northern Wakashan) in (8). In these sentences the quantifiers occupy predicative position and take a DP subject. This is a pervasive phenomenon cross-linguistically (see the papers in Bach et al. 1995, Matthewson 2008, Keenan and Paperno 2012, 2017).

(7) Nkekelhás/cw7it/k’wik’wena7 i=smelh-múlhats=a.
three.HUMAN-many/few DET.PL=PL-women=EXIS
‘The women are three/few.’ (St’át’imcets)

(8) kínám=ox=da gi-gukw many=MED=DET PL-house
‘There are many houses.’ (more literally: ‘The houses are many.’) (Kwak’wala; Moewaki 2016:28)

Strong quantifiers, on the other hand (otherwise known as proportional quantifiers), depend not on the size of the set denoted by the CNP, but crucially on the proportional relation between the CNP and the VP denotation. They thus satisfy the definition in (9), from Keenan (2012:4).

(9) For a quantifier Q and sets A,B, QAB depends on the proportion of As that are Bs: |A∩B|/|A|.

Notice that universal quantifiers also count as proportional quantifiers. Since a universal quantifier requires that all As be Bs, the cardinality of A∩B (the set of As which are also Bs) must be equal to the cardinality of A, which means that the proportion required (|A∩B|/|A|) is equal to 1.

Proportional quantifiers are generally degraded in existential sentences in English, as shown in (10), and cannot function as main predicates, as shown in (11)-(12). In these respects they contrast with weak/intersective quantifiers, as shown in (6)-(8) above.

(10) # There are all/most hedgehogs in the garden.

(11) tákem i=smelh-múlhats=a
all DET.PL=PL-women=EXIS
‘all the women’ (not a full sentence) (St’át’imcets)

1 In citing examples, we retain the orthographic representations used in the original sources; however, glossing and formatting have in some cases been updated. For a list of abbreviations used in morpheme glosses, see the Abbreviations section at the end.
As discussed extensively in the literature (Milsark 1974, Partee 1988, among others), certain quantifier words are ambiguous between a cardinal and a proportional reading. This is true of English quantifiers like many or few. There are syntactic reflexes of these two readings, as seen in (13)a vs. (13)b.

(13)  
a. There are many/few hedgehogs in the garden. (cardinal)  
b. There are many/few of the hedgehogs in the garden. (proportional)

A final important concept is scope. Generalized quantifiers are predicted to enter into scopal relations with each other (and with other scope-bearing operators). Different scope readings for English quantifiers are illustrated in (14). In (14)a, the subject has wide scope relative to the object, and in (14)b the subject has narrow scope relative to the object.

(14) Every child read most of the books.  
a. For every child x, x read most of the books WIDE SCOPE SUBJECT  
b. For most of the books, each child read those books NARROW SCOPE SUBJECT

The discourse context in (15) differentiates the two readings of (14). In this context, the sentence is true under the wide scope subject reading, but false under the narrow scope subject reading.

(15) Context supporting only the wide scope subject reading of (14):  
There are three children (A, B, C) and five books (1, 2, 3, 4, 5). Each child reads three out of the five books, but a different set of three in each case: 

<table>
<thead>
<tr>
<th>A reads</th>
<th>B reads</th>
<th>C reads</th>
</tr>
</thead>
<tbody>
<tr>
<td>books 1, 2, 3</td>
<td>books 2, 3, 4</td>
<td>books 3, 4, 5</td>
</tr>
</tbody>
</table>

2 Historical perspectives

Early formal semantic work on generalized quantifiers was almost exclusively based on English data, but the theory was intended to be universally valid. Barwise and Cooper (1981) proposed a set of semantic universals relating to generalized quantifiers, among them (16).

(16) NP-Quantifier Universal  
[E]very natural language has syntactic constituents (called ‘noun phrases’) whose semantic function is to express generalized quantifiers over the domain of discourse. (Barwise and Cooper 1981:177)
For a decade, (15) was not subjected to systematic cross-linguistic investigation. That changed with Jelinek’s claim that ‘Straits Salish lacks “essentially quantificational” DPs’ (Jelinek 1995:487). Jelinek also made the even stronger claim that Straits possesses only A-quantification, lacking D-quantification completely. Similar claims were made for other North American languages by Baker (1995, for Mohawk (Iroquoian), and Faltz (1995, for Navajo (Athapaskan, a.k.a. Diné bizaad) and Lakhota (Siouan)).

The claim that a language lacks generalized quantifiers cannot be evaluated on the basis of superficial syntactic evidence. Thus, it is not immediately obvious from the examples in (17)-(21) how Straits, Mohawk, Navajo and Lakhota respectively differ in their quantificational strategies from English.

(17) makʷʷ=Ø ʼaw’ p’eq tʊ sp’eqeq
all=3ABS LINK white DET flower
‘They are all / completely white, the flowers.’ (Straits; Jelinek 1995:514)

(18) makʷʷ ’aw’ ʔa-t-Ø cʊ sče:noxʷ
all=1PL.SBJ LINK eat-TR-3OBJ DET fish
‘We ate all the fish/We all ate the fish/We ate the fish completely up.’ (Straits; Jelinek 1995:514)

(19) Awéé’ t’áá’i néítínígó deílozh.
child each 3=read 1sg→3=PL-tickle=PFV
‘I tickled each baby.’ (Navajo; Faltz 1995:293)

(21) Wak’anyeja iyohila wayawa pi.
child each 3=read PL
‘Each child attends school.’ (Lakhota; Faltz 1995:291)

Nevertheless, Jelinek argues that the Straits quantifier makʷʷ ‘all’ is syntactically an adverbial and can freely quantify over events as well as entities. Baker shows that the Mohawk universal quantifier akwéku necessarily takes plural agreement (for example, the predicate in (19) cannot be replaced with wa-ho-yéshu-’, with M.SG.II agreement). He argues that rather than being a true quantifier, akwéku merely ‘emphasizes that the entire referent picked out by the NP is involved’ (1995:24).² Finally, Faltz argues that both Navajo and Lakhota lack an NP category altogether.

² The same can be – and has been – argued for English all: see Lasersohn (1999), Brisson (2003). More broadly, Baker uses three syntactic diagnostics to distinguish ‘true’ quantifiers like English every from all-type quantifiers: ‘true’ quantifiers c-command dependent variables, they show weak crossover effects, and they take singular agreement. In semantic terms, ‘true’ quantifiers presumably create generalized quantifiers, while all-type quantifiers are operators on plural domains.
and that in examples like (20) and (21), the quantifier does not form a generalized quantifier constituent with the common noun phrase.

These proposals had a triply significant effect: they brought North American quantification data to the attention of the field, they inspired subsequent research on other languages, and they posed the important theoretical question of whether the semantics of noun phrases varies in fundamental ways across languages. In the next section we turn to a critical assessment of the evidence for and against D-quantifiers, and generalized quantifiers, in North American languages.

3 Critical issues and topics

The discussion in this section is structured around a set of empirical hypotheses which we have derived from Jelinek’s arguments against the existence of generalized quantifiers in Straits Salish. In each subsection, we include a discussion of Salish, responding directly to Jelinek’s arguments and reflecting our own areal expertise, as well as a broader (and necessarily less inclusive) discussion of literature on other North American language families.

3.1 Hypothesis I: weak quantifiers can be cardinality predicates

Jelinek’s first argument for the absence of D-quantifiers in Straits Salish is that weak quantifiers function as cardinality predicates. This claim is based on data such as (22); the weak quantifier ƞə̆n is in predicate position.

(22) ƞə̆n=Ø cə sčeenəxʷ

big/many=3ABS DET fish

‘They are many, the fish.’

(Straits; Jelinek 1995:519)

It is not surprising, given the discussion in section 1.2, that weak quantifiers in Straits can function as main predicates. The same is true in many other North American languages, including St’át’imcets (7), Kwak’wala (8), Passamaquoddy (Algonquian, (23)), Chickasaw (Muskogean, (24)), Gitksan (Tsimshianic, (25)), and Q’anjob’al (Mayan, (26)).

(23) ’Sami pihce ktanaqsu-pon-ik motewolonu-wok.

because long.ago be.many-PRET-3PL motewolon-3PL

‘because there used to be a lot of motewolomuwok.’

(more literally: ‘because motewolomuwok used to be numerous’.)

(Passamaquoddy; Bruening 2008:72)

(24) Ihoo-at lawa.

woman-NOM be.a.lot

‘There are a lot of women.’

(Chickasaw; Munro 2017:145)

(25) hlibuu=hl gitxsan

few=CN Gitksan

‘There are few Gitksan.’
We conclude that Hypothesis I is supported by North American languages.\(^3\)

### 3.2 Hypothesis II: weak quantifiers can only be cardinality predicates

We have seen that weak quantifiers can be used as cardinality predicates; Jelinek (1995), however, makes the stronger claim that weak quantifiers in Straits Salish must be cardinality predicates. Syntactically, this predicts that quantifiers like Straits ŋən ‘many’ cannot either replace or adjoin to the determiner within a noun phrase; semantically, it entails that weak quantifiers do not have strong, or proportional, readings.

Jelinek does not give evidence – either syntactic or semantic – for this claim in Straits. However, Matthewson (1998) investigates the issue in related St’àt’imcets; she finds that DP-internal weak quantifiers in this language can appear in a DP-internal pre-determiner position unavailable for ordinary adjectives, and allow only proportional readings in this position. Both of these findings are illustrated in (27).

(27) \[\text{Cw7it i=plismən=a} \text{ úxwəl}^4\]

\(^3\) A possible counter-example is provided by Pima (a.k.a. Akimel O’odham; Uto-Aztecan), where according to Smith (2012), the quantifier mu’i ‘many’ requires a partitive ending when it acts as a predicate. Compare (i) with (ii):

(i) Mu’i gogogs ’o tototk
    many PL.dog AUX PL.bark
    ‘Many dogs are barking.’ (Pima; Smith 2012:703)

(ii) Totobi ’o mu’-ij
    PL.rabbit AUX many-PARTIT
    ‘The rabbits are many.’ (Pima; Smith 2012:723)

However, the translation given for (ii) is not partitive, so further investigation is required into these constructions.

\(^4\) This sentence may also be syntactically analyzed with the quantifier in predicate position, taking a headless relative clause as its argument (‘The policemen who went home were many’). However, Matthewson (1998) demonstrates that this alternative structure is not always available, due to categorial restrictions on modification. Gillon (2006/2013) provides even stronger syntactic evidence from Skwxwú7mesh, a Central Salish language closely related to Straits: here, pre-determiner weak quantifiers are freely available in post-predicative positions, where no alternative predicative analysis is possible:

(i) chen kw’ach-nexw [kex ta skwemkəwemay]
    1SG.SBJ see-LCT [many DET dogs]

(more literally: The Gitksan are few.) (Gitksan; Bicevskis et al. 2017:316)

(26) xiwil hon
    many 1PL.B
    ‘There are many of us.’ (Q’anjob’al; O’Flynn 2017:728)

We conclude that Hypothesis I is supported by North American languages.\(^3\)
Many policemen went home.

False in context:  
(\textit{context supporting only the cardinal reading})
There are 100 policemen (along with a bunch of cooks and teachers) at a party. 25 policemen go home, and 75 stay.

False in context:  
(\textit{context supporting only the cardinal reading})
There are 25 policemen (along with a bunch of cooks and teachers) at a party. All the 25 policemen go home.

True in context:  
(\textit{context supporting the proportional reading})
There are 30 policemen (along with a bunch of cooks and teachers) at a party. 25 policemen go home, and 5 stay.  
(\text{St’át’imcets; Matthewson 1998:304-305})

The strong readings of St’át’imcets DP-internal quantifiers are further illustrated in (28). In this discourse context, it is true that a large proportion of policemen are women (80/100), but false that a large proportion of women are policemen (80/500). In this situation (28)a is judged as true and (28)b as false. These results make sense if the DP-internal weak quantifier \textit{cw7it} ‘many’ is being interpreted proportionally.

(28) \textit{Context: There are 500 women, 100 policemen, and 80 of the policemen are women.}

\begin{itemize}
\item a. syáqtsa7=wit [i \textbf{cw7it}=a plísmen]  
woman=3PL [DET.PL \textbf{many}=EXIS policeman]  
\text{‘Many (of the) policemen are women.’}  
\text{\textit{(judged true)}}
\item b. plísmen=wit [i \textbf{cw7it}=a syáqtsa7]  
policeman=3PL [PL.DET \textbf{many}=EXIS woman]  
\text{‘Many (of the) women are policemen.’}  
\text{\textit{(judged false)}}
\end{itemize}

(St’át’imcets; Matthewson 1998:302)

This evidence suggests that Hypothesis II is false for Salish. Matthewson further argues that the proportional readings of elements like St’át’imcets \textit{cw7it} ‘many’ and \textit{k’wik’wena7} ‘few’ constitute an argument for generalized quantifiers in Salish.

Looking to other North American languages, it seems to be common for weak quantifiers to appear as modifiers inside DPs. One example of this is Gitksan, where the quantifiers for ‘many’ and ‘few’ take the attributive marker when appearing inside DP, just like ordinary adjectives. Note that in (29) and elsewhere, =\textit{hl} (glossed as ‘CN’ for ‘common noun connective’), is an enclitic determiner which forms a prosodic constituent with the preceding word but a syntactic constituent with the following noun phrase.

(29) gya'a'-y=hl held-a xbiist  
see(\text{TR})-1SG.II=CN many-ATTR box

\text{‘I saw many dogs.’}  
(S\text{kw}xw\text{wû}mesh; Gillon 2006:27)
Weak quantifiers in post-determiner positions within DP are compatible with a Jelinek-style analysis in which these elements are always intersective modifiers rather than D-quantifiers. However, Bicevskis et al. show that in DP-internal positions the Gitksan quantifiers *helt* ‘many’ and *hlibuu* ‘(a) few’ have not only weak/cardinal readings, but also strong/proportional readings. An unambiguously cardinal case of *hlibuu* ‘(a) few’ is illustrated in (30), and an unambiguously proportional reading of the same quantifier is shown in (31).5

(30) hlibuu=hl simgigyet=hl bagw-it go’o=hl li’ligit. gwalk’a ‘nidiit
few=CN PL.chief=CN PL.come-SX LOC=CN feast all 3PL.III
si’moogit-xw-u’m
PL.chief-PASS-1PL.II (context supporting only the cardinal reading)
‘Few chiefs came to the feast. They were all the chiefs we have.’

(Gitksan; Bicevskis et al. 2017:315)

(31) Context: There are 30 million people in Canada. 10 million voted NDP.

hlibuu=hl gyet en=t ksgya’a=hl NDP
few=CN person AX=3.1 choose=CN NDP
‘Few people chose the NDP.’ (context supporting only the proportional reading)

(Gitksan; Bicevskis et al. 2017:318)

In Chickasaw, weak quantifiers such as *lawa* ‘many’ pattern syntactically as reduced relative clauses when DP-internal; Munro (2017) does not discuss their interpretation, though the prediction is that they will yield only cardinal readings.

[peach be.a.lot-FOC.DS] eat-1S.1-PT
‘I ate a lot of peaches.’ (literally ‘I ate the peaches which were many’)

(Chickasaw; Munro 2017:146)

In Passamaquoddy, *ktanaqsu* ‘many’ is a verb, but it can appear as ‘a modifier forming a constituent with the noun’, without being inflected as if it were part of a relative clause (Bruening 2008:72).

(33) Koluskap neke wiku-ss monihku-k wiciw ktanaqsu-wok skicinu-wok K. then.PAST live.3-PRET island-LOC together.with be.many-3PL Indian-3PL
‘Long ago, Koluskap lived on an island with many Indians.’

(Passamaquoddy; Bruening 2008:73)

For Pima, Smith (2012) argues that the language has no monomorphemic proportional quantifiers. However, *mu’i* ‘many’, which as we saw above does not straightforwardly pattern

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5 The Gitksan cases are complicated by the fact that weak quantifiers in clause-initial position are structurally ambiguous between main predicate and DP-internal uses. See Bicevskis et al. (2017:313) for ways to distinguish the two structures.
like a predicate, behaves as a ‘standard D-quantifier’ when inside DP (Smith 2012:703).

(34)  Mu’i  gogogs ’o  tototk
       many  PL.dog  AUX  PL.bark
       ‘Many dogs are barking.’  (Pima; Smith 2012:703)

To summarize: contra Jelinek, DP-internal weak Qs in Salish languages appear to have only strong readings, while in Gitksan, DP-internal weak Qs are ambiguous between strong and weak readings. Evidence is fragmentary elsewhere, because systematic semantic investigation has not been carried out. However, it has yet to be shown in any North American language that DP-internal weak Qs lack a proportional reading. We conclude that Hypothesis II is falsified at least for those North American languages for which data are available.

3.3  Hypothesis III: strong quantifiers may be expressed as A-quantifiers

We begin this section by distinguishing two notions of ‘A-quantification’, and setting one aside. The first involves quantification over events or situations as opposed to over individuals. The second is confined to quantification over individuals, but involves the quantifier being syntactically associated with the predicate rather than with an argument.

These two notions do not necessarily coincide, either in English or in North American languages. The DP-internal use of event-related adjectives such as occasional represents a case in point in English (Zimmermann 2000), while in North America, Matthewson (2000) shows that in St’át’imcets, the DP-internal quantifier pipálà7 ‘one by one’ always quantifies over events, not individuals. For example, the context in (35) is one where it is not true that all the boxes were lifted, but it is true that every sub-event is a temporally-separated box-lifting event. In this context, the individual-related universal quantifier tákem ‘all’ is infelicitous ((35)a), but the event-related universal quantifier pipálà7 is felicitous ((35)b).

(35)  Context: There are four boxes in the room. Rose lifts three of them, one at a time.

(a) #  cât-an’-as  s=Rose  [tákem  iz’  i=xétsem=a]  
     lift-TR-3ERG  NMLZ=Rose  [all  those  PL.DET=box-EXIS]
     ‘Rose lifted all of those boxes.’

(b)  √  cât-an’-as  s=Rose  [pipálà7  iz’  i=xétsem=a]  
     lift-TR-3ERG  NMLZ=Rose  [one-by-one  those  PL.DET=box=EXIS]
     ‘Rose lifted those boxes one by one.’  (St’át’imcets; Matthewson 2000:104)

We set these cases aside for reasons of space, focusing instead on the second notion: A-quantification over individuals. Here, the primary diagnostics involve demonstrating that a quantificational element does not form a constituent with the CNP that restricts it. This might appear to be straightforward, but the possibility of syntactic movement (via quantifier ‘floating’, ‘stranding’, or incorporation) complicates the diagnosis, as witnessed by the debate in English and French as to whether DP-external all and tous are stranded by syntactic movement or base-generated as adverbials (see Bobalijk 2003 for an overview).
These debates have counterparts in North America. For example, Bach (1995:19) claims that in Haisla (Northern Wakashan), ‘Meanings associated with determiners or generalized quantifiers are restricted to roots and stems’, which he takes as evidence that the language lacks D-quantification. An example of a quantificational root is $q'i$ ‘much, many, a lot’, as in (36).

(36)  
\[
\begin{array}{ll}
\text{q'i-utl} & \text{John mia'i\=xi.} \\
\text{much-catch} & \text{John fish-3PL.DEM} \\
\end{array}
\]

‘John caught a lot of fish.’

(Haisla; Bach 1995:17)

Bach rejects a syntactic derivation in which V-associated quantifiers are incorporated from an argument position (thus potentially being D-quantifiers), because that would entail that ‘incorporating’ verbs like ‘catch’ were suffixal: they cannot surface without an incorporated element to their left. However, exactly such an analysis has been independently proposed for the Southern Wakashan language Nuu-chah-nulth (Wojdak 2008): there, amongst other evidence, the ‘bound verb’ hypothesis is supported by the fact that the incorporating element can strand a phrasal remnant in argument position, one of the hallmarks of syntactic incorporation. This is not to say that such an analysis is necessarily right for Haisla, but generally, the existence of a quantificational element in a non-argument position cannot necessarily be taken to indicate it is an A-quantifier.

This argument cuts both ways: just as superficial syntactic properties cannot be taken as evidence for an A-type analysis, they also cannot be taken as evidence for a D-type analysis. For example, in the course of her detailed study of morpheme order and scope inside the verb across the Athabaskan language family, Rice (2000) shows that many Athabaskan languages have a distributive prefix, illustrated in (37) for Beaver (a.k.a. Dane-zaa), which can contribute universal quantification over an argument.

(37)  
\[
\begin{array}{ll}
dà-ghə-d-i-ze \\
\text{DISTRIB-HUMAN.PL.SBJ-QUALIFIER-QUALIFIER-STEM} \\
\end{array}
\]

‘They each shout.’

(Beaver; Rice 2000:47)

Although the distributive prefix appears inside the verbal template, Rice shows that it quantifies exclusively over individuals rather than over events; she therefore classifies it as a D-quantifier (in fact, even as a determiner; Rice 2000:59). However, accounts of distributivity based on the theory of plurality developed by Link (1983) posit a null distributive operator over the predicate (see for example Cable 2014 on distributive numerals in Tlingit (Na-Dene)), which is exactly where the overt distributive prefix occurs in Athabaskan languages. On such an analysis, the distributive prefix counts as a canonical case of A-type quantification, even though its domain is that of individuals.

With this in mind, let us return to Jelinek’s claim that Straits lacks D-quantification. For strong quantifiers, this claim can be broken down into two parts, the first (less radical) part being that strong quantifiers can be A-quantifiers. Jelinek’s canonical case of a strong quantifier, the universal $məkʷ$ ‘all’, standardly appears in a non-argument position preceding the predicate, so this prediction appears to be borne out (see also (17)).
However, Jelinek provides no evidence against an analysis where the quantifier is syntactically displaced from an argument position. This is possible in Salish: in a detailed examination of the syntax of universal quantifiers in Salish, Davis (2013) shows that instances of what he refers to as ‘quantifier fronting’ show standard movement diagnostics. However, Davis also identifies two cases of base-generated pre-predicative universal quantifiers, both of which fail movement diagnostics. In one of these, illustrated in (39), the quantifier is an auxiliary, as demonstrated by its position following other auxiliaries and preceding the main predicate. It therefore represents a canonical case of A-quantification.

(39) ni ṁakʷ ʔu-wəwáʔəs [kʷəθə=sqʷəmqʷəményʔ]
AUX all LINK-bark [DET=dog(PL)]
‘All the dogs barked.’
(Island Halkomelem; Gerdts 1988:80)

Given the close resemblance between the Halkomelem case and its Straits equivalent, we can conclude that pre-predicative ṁakʷ does indeed involve A-quantification, thereby supporting the first part of Jelinek’s claim.

Looking further afield in North America, potential cases of A-type quantification over individuals are not hard to come by. While in many of these cases alternative analyses involving syntactic movement have not been conclusively ruled out, there is at least one type where a movement account seems implausible, simply because there is no source in argument position

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6 Part of Jelinek’s argumentation that ṁakʷ is an A-type quantifier is that it unselectively quantifies over entities and events, as suggested by the translations of (38). However, Davis (2013) shows that these translations are misleading. The reason is that in Straits (a) number marking on DPs is optional, and (b) the universal quantifier ṁakʷ, like English all, can quantify either over individuals or proper subparts of individuals. There is therefore a reading of (38) in which ṁakʷ quantifies over proper subparts of ce sčeenaxʷ ‘the fish’; this is truth-conditionally indistinguishable from an event-related ‘completely’ reading. (The same reasoning applies to the case in (17) above.) However, it is possible to test specifically for event-related readings by using singular arguments with predicates where proper subpart readings are absurd, as in the St’át’imcets example in (i):

(i) # takem=lhkácw=ha tsúkw-al’ts
all=2SG.SU=YNQ finish-food
# ‘Has all of you (i.e., each proper subpart) finished eating?’
≠ ‘Have you completely finished eating?’
(St’át’imcets; Davis 2013:243)

The only reading available here is the absurd proper subpart reading, showing that the (pragmatically plausible) event-related reading is unavailable. More generally, Davis concludes that universal quantifiers in Salish are sortally restricted to individuals.
for the putative movement. In Blackfoot (Algonquian), universal quantification involves the bound preverb *ohkan-*, which has no analogue in the argument domain:

(40) ómiksi ninaksi **iihtohkaná**yisstsinimyaa óttowan omi pisatsskiitaan om-iksi ninaa-iksi **iy**-**ohk**ana-yisstsinin-yaa wa ot-isttowan om-yi pisatsskiitaan DEM-PL man-PL means-all-cut.VTI-3:0-3PL 3POSS-knife DEM-0 cake

‘Every man used his $i/j$ knife to cut the cake.’ (Blackfoot; Louie 2014:53)

In another set of cases, a syntactic account can be ruled out on the basis of the failure of recognized movement diagnostics. For example, A'-movement in Gitksan has a conspicuous morphologic al signature in the form of distinct extraction marking for intransitive subjects, transitive subjects, and objects (Bicevskis et al. 2017). In certain cases, movement of a quantified phrase triggers this morphology (41)a, but there are also cases of ‘Q-float’ where no extraction morphology occurs (41)b; in these latter cases, we can safely assume that A-quantification is involved, since there is no movement.

(41) a. **[gwalk’a ’nit=hl haanak’]**=hl miiluxw-it. **[all 3SG.III=CN PL.woman]**=CN dance-sx

‘All the women danced.’ (Gitksan; Bicevskis et al. 2017:331)

b. **gwalk’a miiluxw(*-it)=hl haanak’**.

**all dance(*-sx)=CN PL.woman**

‘All the women danced.’ (Gitksan)

To conclude this section, we can confidently say that strong quantifiers over individuals in North American languages are rather frequently expressed by A-quantification strategies. Hypothesis III is therefore upheld.

3.4 **Hypothesis IV: strong quantifiers can only be expressed by A-type quantification**

As we saw above, Jelinek’s claim that Straits employs an A-type strategy for strong quantifiers is supported. However, Jelinek fails to give negative evidence showing that strong quantifiers cannot form a DP constituent with their restriction. In fact, it turns out that they can, as shown below in an example elicited from one of Jelinek’s original consultants; here, the universal quantifier *mə̱kʷ* must be analyzed as part of the post-predicative DP.

(42) **ŋa-t=ɬ=kʷəʔ [makʷ ksə=sčeenəxʷ]**

eat-TR-1PL.SBJ=INFER [**all** DET=fish]

‘We ate all the fish.’ (Straits; Davis 2013:221)

The same is true across Salish; Matthewson (1998) shows that in at least the following languages, universal quantifiers form syntactic constituents with argument DPs: St’át’imcets, Secwepemcotsin (a.k.a. Shuswap, Northern Interior), Upper Chehalis (Tsamosan), Halkomelem (Central), and *Skwxw7mesh* (Central). No Salish language has been shown to lack such constituents.

Hypothesis IV is thus falsified both in Straits and across the Salish family. Elsewhere in North
America, however, the evidence is not as clear-cut. Part of the problem is that showing that a language lacks D-quantifiers involves targeted elicitation of negative evidence, and for many languages, this type of evidence is missing. Often the nearest we can get is a weak inference from the absence of DP-internal strong quantifiers in the available data to their ungrammaticality. The problem is more acute in languages that lack overt determiners altogether (which includes members of many major North American language families, including Algonquian, Athabaskan, Eskimo-Aleut, Iroquoian, and Uto-Aztecan), and even more so in those with potentially discontinuous arguments (including Algonquian, Athabaskan, and Iroquoian).  

Given this, the best potential candidates for languages without D-quantification are those like Blackfoot where strong quantifiers only occupy predicate-related positions. Blackfoot is critically different in this respect from related Algonquian languages such as Cree (Reinholtz 1999) and Passamaquoddy (Bruening 2008), which do allow quantifiers to form constituents with argument phrases.

In short, there may be North American languages without D-quantification. However, care needs to be taken to ensure that a quantifier in the predicate domain is not related to an argument position by syntactic movement.

3.5 Hypothesis V: there are no quantificational determiners

Though Jelinek’s broad claim that Northern Straits lacks D-quantification is false, there is a narrower sense in which she is correct. As she points out, ‘Straits entirely lacks Determiners corresponding to each, every, most, some, few, no, numbers, etc.’ (Jelinek 1995:511). The same is true of every other Salish language: there are no quantificational elements which occupy D position and take common noun phrases as their sister. This means that Salish falsifies another of Barwise and Cooper’s proposed universals, given in (43).

(43) **Determiner Universal**

Every natural language contains basic expressions, (called determiners) whose semantic function is to assign to common count noun denotations (i.e., sets) A a quantifier that lives on A. (Barwise and Cooper 1981:179)

This is a significant point of variation between Salish and European languages, which Matthewson (1998) links to another point of variation, namely that Salish languages lack definite determiners. Since both definites and strong quantifiers involve presuppositions, and since presuppositions place restrictions on the common ground of the discourse, Matthewson argues that the absence of both definites and quantificational determiners in Salish follows from a general restriction on determiners (rather than a restriction on quantifiers). She proposes that

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7 ‘Determiners’ here excludes demonstratives, which have different syntax and semantics from ‘true’ determiners in many languages; see for example (32) above, where demonstratives and determiners co-occur in St’át’imcets.

8 The property ‘lives on’ is otherwise known as conservativity, and states that Q(A)(B) is true if and only if Q(A)(A∩B) is true. The point here is the prediction that all languages have determiners which turn common noun phrases into generalized quantifiers.
elements in D position in Salish may not encode distinctions which rely on the common ground (Matthewson 1998:114). 9

More broadly, the absence of quantifiers which replace determiners and take NPs as their restriction is a recurring theme in many North American languages. For example, in Kwak’wala, both strong and weak quantifiers always co-occur with determiners when inside DPs (Moewaki 2016). The syntactic position of the strong quantifier wi’la ‘all’ is illustrated in (44); the accusative marker is part of Kwak’wala’s extremely complex determiner system.

(44) hα’m-x’i’d=i Ruby [DP wi’la [DP =x’a [NP lemon]].
   eat-PFV=DIST Ruby all =ACC lemon
   ‘Ruby ate all the lemons.’ (Kwak’wala; Moewaki 2016:44)

The same is true in Gitksan; Bicevskis et al. (2017:378) observe that in this language, although there are D-type quantifiers, there is an ‘absence of quantificational determiners: Gitksan determiners … primarily contribute a domain-restricting function, and there are no direct equivalents of English determiners like ‘no’, ‘some’ or ‘every’.’ For Pima, Smith (2012) similarly argues that D-quantifiers are adnominal, not in determiner position. Pima quantifiers are frequently floated, but may also appear inside DP following the determiner, or preceding the determiner in a partitive structure.

North American languages which lack (overt) determiners altogether cannot by definition display the pattern where D-quantifiers combine with determiners. In fact, it seems that in languages of this type quantificational elements might vacuously satisfy the Determiner Universal, since in the absence of determiners adjoined quantifiers occur directly adjacent to their NP restrictions, as shown below for Passamaquoddy and San Lucas Quiavini Zapotec (SLQZ):

(45) Psite wasis kisi-ntu.
   all child PRV-sing
   ‘Every child sang.’ (Passamaquoddy; Bruening 2008:79)

(46) Yra’ta’ gyiia’ nàa ncyets
every/all flower N.be white
   ‘All the flowers are white.’ (SLQZ; Lee 2008:356)

However, the analysis of such strings turns on the status of bare noun arguments in the relevant languages. There are at least three possibilities. First, they could be of predicative type, like English common noun phrases, in which case the quantifiers would indeed count as (semantic) determiners. Second, they could be of argumental type, as in Chierchia’s (1998) account of bare nouns in Chinese, or in the North American context, Wilhelm’s (2015) analysis of the

9 Lyon (2013) confirms this for Nsyílxcen (Okanagan; Southern Interior Salish), but Gillon (2006/2013) argues against it based on Skwxwú7mesh. Further afield, Lee (2008) argues that San Lucas Quiavini Zapotec (Otomanguean) also lacks determiners which access the common ground.
Athabaskan language Dëne Sûliné (Chipewyan). Or alternatively, ‘bare’ nouns could have silent determiners, in which case their semantics would be that of full DPs (see Gillon 2015 for discussion of diagnostics in this realm).\(^\text{10}\)

Lee (2008) argues explicitly for this third possibility for SLQZ. She shows that bare nouns are freely used with both definite and indefinite readings, and with both singular and plural readings, and she argues that ‘bare noun arguments in SLQZ are DPs with silent determiners’ (2008:371). She further shows that SLQZ quantificational elements ‘show predicate-like behavior inconsistent with determiner status’ (2008:356).

There is also evidence in Passamaquoddy that quantificational elements do not combine directly with NPs. Bruening observes that in this language quantifiers may co-occur with demonstratives and may take pronouns as their restrictions. Neither of these is possible for standard quantificational determiners, as shown by the ungrammaticality of English *every that woman, *no them. Under the assumption that quantifiers have a uniform semantic type within each language, these data suggest that Passamaquoddy quantificational elements never combine directly with common noun phrases.

\[
\text{(47) Psite / peskuwok nekomaw mokesew-sew-hotu-wok.} \\
\text{all/some.3PL 3PL black-dress-PL-3PL} \\
\text{‘All/some of them are dressed in black.’ (Passamaquoddy; Bruening 2008:87)}
\]

In short, Hypothesis V holds up well in North America: quantificational determiners are rare to absent, providing evidence against the Determiner Universal.

### 3.6 Hypothesis VI: some languages lack generalized quantifiers

Having seen that many North American languages violate the Determiner Universal, in this section we revisit the NP-Quantifier Universal. The implicational relation between these two notions is as follows: a language which possesses determiner quantifiers in the narrow sense of the Determiner Universal will necessarily have generalized quantifiers, but a language which lacks them could still have generalized quantifiers (henceforth sometimes abbreviated to ‘GQs’). This is because there is a distinction between the semantics of an entire quantified noun phrase (what the NP-Quantifier Universal is about) and the internal syntactic composition within that quantified noun phrase (what the Determiner Universal is about).

In this vein, Matthewson (1998) specifically argues that although Salish languages falsify the Determiner Universal, they do not falsify the NP-Quantifier Universal. She argues that the bracketed constituents in (48), where a quantifier word co-occurs with a determiner rather than replacing it, are nevertheless generalized quantifiers.

\[
\text{(48) a. [cw7it i=tsitcw=a] wa7 tseqwtsiqw} \\
\text{[many DET.PL=house=EXIS] IPFV red}
\]

\(^{10}\)Gillon (2006/2013) suggests that the last option may be the case for Skwxwú7mesh, a language which possesses overt determiners and allows quantifiers to appear either in combination with full DPs, or in structures without an overt D such as in (45)-(46).
'Many houses are red.'  (St’át’icmets; Matthewson 1998:250)

b. qwatsáts=tu7 [tákem i=sk’wemk’úk’wm’it=a]
    leave=then [all DET.PL=children=EXIS]
    ‘All the children left.’  (St’át’icmets; Matthewson 1998:238)

Syntactically, Matthewson shows that quantificational elements form constituents with their restrictions; semantically, she argues that their truth conditions parallel their counterparts in languages like English, including importantly allowing strong/proportional readings, as illustrated in (27) above. Matthewson (2001) provides a compositional analysis of St’át’icmets quantified phrases which assimilates them roughly to English partitives like all (of) the women, with a difference in the semantics of determiners between the two languages, but the same semantics for quantified DPs.

A decade later, however, the semantic component of this proposal was put into question by Davis (2010, 2013). Davis argues that quantified DPs in St’át’icmets fail to satisfy one of the core predictions of generalized quantifier theory, that they should participate in scopal interactions. He therefore proposes that St’át’icmets – and by extension, the whole Salish family – lacks GQs after all, as originally conjectured by Jelinek.

To illustrate the argument, let us adopt the simple concrete analyses of the GQ-creating quantifiers all and half in (49). From this, and allowing Quantifier Raising to give inverse scope, we predict that (50) has the two readings given in (50)a,b.

(49)  a. [[ all ]] = λP . λQ . ∀x [x ∈ P → x ∈ Q]
    all applies to a CNP and a VP and creates a proposition which is true if and only if all atomic members of the set denoted by the CNP are members of the set denoted by the VP

b. [[ half ]] = λP . λQ . | P ∩ Q | ≥ ½ | P |
    half applies to a CNP and a VP and creates a proposition which is true if and only if the cardinality of the set of individuals who are members both of the set denoted by the CNP and of the set denoted by the VP is greater than half the cardinality of the set of individuals denoted by the CNP.

(50)  All the children read half the books.
    a. ∀x [child(x) → [ | {z : z is a book and x read z} | ≥ ½ | {y : y is a book} | ]]
       WIDE SCOPE SUBJECT

    b. | {z : z is a book & ∀x [child(x) → [x read z]]} | ≥ ½ | {y : y is a book} |
       NARROW SCOPE SUBJECT

In a scenario with four children and four books, the reading in (50)a requires that each child reads (at least) two books, while (50)b requires it to be the case for (at least) two books (say, books 1 and 2) that every child read them. While the second reading is dispreferred, the general expectation is that both readings will be possible.
Consider now the Stʼátʼimcets sentence in (51). If tákəm ʔi=ʃkʷúkʷmiʔt=a ‘all the children’ and šáqʷul ʔi=púkʷ=a ‘half the books’ were generalized quantifiers, we would expect the same two scopal readings as in English.

(51)  
Context: Four children are meant to read four books over the summer holidays.  
[ tákəm ʔi=ʃkʷúkʷmiʔt=a ] paqʷalˈikst-min-itaš  
[ all  DET.PL=child=EXIS ] read-RED-3PL.ERG  
[ šáqʷul ʔi=púkʷ=a ]  
‘All the children read half the books.’  
(Stʼátʼimcets; Davis 2010)

Davis establishes that (51) does not allow either of these readings, by showing that the sentence is rejected by speakers in discourse contexts which satisfy the first reading and not the second (as in (52)a), and also rejected in contexts which satisfy the second reading and not the first (as in (52)b).

<table>
<thead>
<tr>
<th></th>
<th>A reads</th>
<th>B reads</th>
<th>C reads</th>
<th>D reads</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>books 1,2</td>
<td>books 2,3</td>
<td>books 3,4</td>
<td>books 1,4</td>
</tr>
<tr>
<td>b.</td>
<td>books 1,2,3</td>
<td>books 1,2,4</td>
<td>books 1,2,3,4</td>
<td>books 1,2</td>
</tr>
</tbody>
</table>

Instead, (51) is acceptable only in contexts which support a cumulative reading (Scha 1981): those in which all the children did reading, and a total of two titles were read. Cumulative readings involve a relation between two sets which each have a specified size. They crucially do not involve generalized quantifier interpretations.

How can these results be reconciled with Matthewson’s earlier findings that DP-adjointed quantifiers in Stʼátʼimcets have (only) proportional readings? While traditionally, proportional quantifiers have been assumed to form GQs, the Stʼátʼimcets findings suggest that proportionality can exist without scopal interactions; Davis provides an account in which proportional quantifiers impose restrictions on the domains of plural DPs created by choice function determiners (Reinhart 1997, Winter, 1997, Kratzer 1998, Matthewson 1999, among others).

If the absence of scopal effects is criterial, Stʼátʼimcets thus represents a language which lacks generalized quantifiers. Though work in this area has not been systematically undertaken for other Salish languages, there is some research on other North American families which indicates that DP-internal (but non-determiner) quantifiers do participate in scope interactions. Bruening (2008) argues that in Passamaquoddy direct-marked clauses, quantified subjects always scope over quantified objects, but in inverse-marked clauses, either subject or object may take wide scope. For Gitksan, Bicevskis et al. (2017) show that for at least some speakers and some quantifiers, true scopal interactions are possible. And Moewaki reports that in Kwakʼwala, all logically possible scopal readings are available between two clausemate quantifiers. An example is given in (53). This sentence is accepted by speakers in all four scenarios.  

(53)  
wi'la-ˈm=ox=da  
{ts'i-ts'adak}  
dalaxa  
{sa:k'a  
gi-galdas}  
lax=ɨ's  
gukw.

11 What Moewaki calls ‘distributive’ and ‘inverse distributive’, we above called ‘wide scope subject’ and ‘narrow scope subject’ respectively.
All = DISC = MED = DET  PL-woman  carry = ACC  five  PL-box  PREP = POSS  house

‘All the women carried five boxes to her (another woman’s) house.’

i.  Collective: Four women together carried five boxes.
ii.  Distributive: Four women carried five boxes each (20 boxes total).
iii. Inverse distributive: Five boxes were each carried by four women (20 women total).
iv.  Cumulative: A total of four women carried a total of five boxes, in some combination.
    (Kwak’ala; Moewaki 2016:111)

Such data seem to confirm that DP-internal quantifiers can enter into scopal interactions, and by assumption, are GQ-creating.

There is even less data on scopal interactions between DP-internal and DP-external (‘A-type’) quantifiers, but what there is indicates that there is no difference in scope interactions between these cases and those with two DP-internal quantifiers. For Passamaquoddy, Bruening (2008:89) explicitly states “I have been unable to find any interpretive differences between split and non-split quantifiers … both have the same scopal properties”, where ‘split’ quantifiers feature a predicative quantifier associated with a restriction in a postverbal argument position. For Gitksan, Bicevskis et al. (2017:334) also claim there is no interpretive difference between ‘floated’ (adverbial) and DP-internal universal quantifiers.

4  Conclusion: Variation in quantificational strategies in languages of North America

We are now in a position to reassess the quantificational landscape of North American languages. Perhaps unsurprisingly, it is more complex than first imagined.

For Jelinek, a simple binary parameter separates conventional ‘D-quantificational’ languages like English from ‘A-quantificational’ languages like Straits Salish: the former have determiner quantifiers which create generalized quantifiers, while the latter lack both, and instead have adverbial quantifiers which unselectively quantify over both entities and events.

What we find on closer inspection is a very partial validation of this view. Determiner quantifiers are indeed systematically absent from Straits Salish, Salish more generally, and possibly from North America as a whole; but DP-internal quantifiers are present in Straits and all other Salish languages, and at least very commonly in the rest of North America (with some caveats about languages such as Blackfoot where strong quantifiers only appear in the verbal complex). However, this does not mean that all these languages have generalized quantifiers, as shown by Stát’imcets: the possibility that strong (proportional) quantifiers are not GQ-creating, as diagnosed by their lack of scope, means that DP-internal position is a necessary but not sufficient condition for a GQ.

On the A-quantification side, the picture is even more complex. Not all A-quantifiers are unselective binders in the original sense of Lewis (1975): in fact, many if not most strong quantifiers in ‘adverbial’ positions in North American languages are sortally restricted to entities, with event quantification being conveyed by different lexical items. It is tempting for this reason to assimilate them to D-quantifiers via syntactic movement, but A-quantifiers may be base-
generated in predicate-related (adverbial and auxiliary) positions. As yet, however, it is unclear what interpretive differences – if any – there are between A-quantificational and D-quantificational instances of entity-related strong quantifiers.

**Further Reading**

Bach et al. (1995) is a key reference for the study of quantification in North American languages, containing a number of foundational papers structured around the distinction between A-quantification and D-quantification.

Matthewson (2008) and the two volumes edited by Keenan and Paperno (2012 and 2017) contain a number of articles on quantification in North American languages. The Keenan and Paperno volumes are structured around a specific questionnaire in order to allow direct cross-linguistic comparison.

**Acknowledgments**

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**Abbreviations**

Abbreviations which are not in the Leipzig Glossing Rules are as follows: 0 = third person inanimate, ACC = accompanying, ATTR = attributive, B = series B agreement marker (Mayan), CIRC = circumstantial modal, CN = common noun connective, DISC = discourse marker, DIST = distal invisible, DS = different subject, EXIS = assertion of existence, FACT = factual mode, I,II,III = series I,II,III pronoun, INFER = inferential, INFR = informative, LC = limited control, MED = medial visible, PART = particle, PARTIT = partitive, PRET = preterite, PRV = preverb which usually has past or perfective interpretation, PT = past/perfective, PUNC = punctual aspect, RED = redactive transitivizer, SX = intransitive subject extraction, TR = transitive, VTI = transitive inanimate (object) verb stem.

**References**


Davis, Henry. 2010. Salish languages lack generalized quantifiers after all! Paper presented at SALT 20, University of British Columbia / Simon Fraser University.


