

Nsyilxcen Modality

Semantic analysis of epistemic modality

by

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Abstract

The aim of this thesis is to describe and analyze the modal system of Nsyilxcen, an Interior Salish language spoken in south central British Columbia and northern Washington State. In particular, it focuses on the epistemic modals *mat* and *cmay*, which express necessity and possibility with respect to certain bodies of knowledge. Similar to modals in St'át'imcets (Rullmann et al. 2008) and Gitksan (Peterson 2010) these modals lexically encode an epistemic modal base and an indirect inferential evidential restriction. I propose that these two modals can be distinguished based on their modal force distinction, where *mat* has variable modal force and *cmay* a strictly encoded existential modal force. Based on these generalizations, I propose a formal semantic analysis for the epistemic modals drawing from Kratzer (1977, 1981, 1991, 2012), Rullmann et al. (2008), Peterson (2010), and Deal (2011). The analysis defines each modal in a way that accounts for the strictly encoded modal base and evidential restriction, as well as the variable modal force for *mat* and the strictly encoded existential modal force for *cmay*. In addition to the epistemic modals *mat* and *cmay* this thesis documents the reportative modal *k^wuk^w* as well as how Nsyilxcen encodes non-epistemic modality. It looks at the bouletic modal *cak^w* and how Nsyilxcen encodes a deontic, circumstantial, ability, and teleological modal base. This thesis will discuss how the Nsyilxcen system fits into a preliminary modal typology based on the semantics of these modals.

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List of Abbreviations

ABS = absolute	INCEP = inceptive
AFF = affirmative	IRR = irrealis
ASP = aspect	LEX = lexical particle
BOUL.MOD =bouletic modal	LOC =locative
CAUS = causative	MID = middle
CTR = control	MOD = modal
CONT = continuous verbal prefix	NEG = negation
CON = continuative verbal prefix	NOM =nominalizer
CUST = customary	OBL =oblique
COMP = complementizer	PART =particle
DEM = demonstrative	PL =plural
DET = determiner	POSS = possessive
DER = derivative	Q =question particle
DIR = directive transitivizer	RED =reduplication
EMPH = emphatic	RES = resultive
EPIS.MOD = epistemic modal	SG =singular
ERG = ergative	STAT = stative
FUT = future	TRANS =transitivizer
IMP = imperative	YNQ = Yes/No question particle

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Chapter 1

Introduction

This thesis is an investigation into the modal system of the Nsyilxcen Salish language. Modality deals with the expression of possibilities and necessities. Modalized sentences allow speakers to talk about possible alternatives to the way the world actually is at the utterance time relative to certain bodies of knowledge, or facts (Kratzer 1977, 1981, 1991, 2012; von Stechow and Heim 2011). The goals of this investigation are summarized in (1):

- (1)
 - i. To provide a detailed description of the Nsyilxcen modal system in its entirety.
 - ii. To provide a formal semantic analysis for the inferential epistemic modals of this system that adequately explains the meanings of epistemic modality in Nsyilxcen.
 - iii. To contribute to the documentation of the Nsyilxcen language.

This thesis takes Kratzer's theory of modality as the theoretical basis for exploring the Nsyilxcen modal system. Opinions vary as to how the modal space is divided, but there is general agreement that a basic distinction is drawn between epistemic and non-epistemic modality. Epistemic modality expresses possibility and necessity with respect to the speaker's knowledge and beliefs relative to the situation, and with respect to the evidence available to the speaker at the time of utterance. For example, consider the following English example provided by Kratzer (1991), where a police inspector is investigating a crime scene. Given the evidence available to him/her the detective can draw conclusions as to who the murderer is. The more evidence available to the detective the stronger the statement he/she can make (Kratzer 1991).

- (2)
 - a. Michl must be the murderer
 - b. Michl is probably the murderer

- c. There is a good possibility that Michl is the murderer
- d. Michl might be the murderer
- e. There is a slight possibility that Michl is the murderer

The claim is that all languages are able to express epistemic possibility and necessity and the grades of strength in between. Consider the Nsyilxcen example (3) where the speaker is making a statement about Mary's whereabouts given what he/she knows about Mary and her schedule. In this possibility context the speaker's knowledge is not conclusive and they are uncertain whether Mary is running, or if she is shopping or at school. Nsyilxcen has two modals that can be used to express the speaker's high level of uncertainty in this context.

(3) Context: You know that Mary loves to go running and often goes on runs randomly. However, she could also be at the store or at school. I ask you, where is Mary? You reply:

- a. *Mary mat ac-qíc-lx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'
- b. *Mary cmay ac-qíc-lx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'

Example (4) provides a necessity context where there is more evidence available to the speaker, leading the speaker to be more certain that Mary is running. In this context, the modal *cmay* is no longer permitted.

(4) Context: Mary runs every day to train for a marathon. She usually runs at 6pm on Tuesdays. Today is Tuesday and it's 6pm. I ask you, where is Mary?

- a. *Mary mat ac-qíc-lx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary must be running'
- b. # *Mary cmay ac-qíc-lx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'

In addition to necessity and possibility with respect to a speaker's knowledge and beliefs, recent literature has argued that epistemic modals also specify the source of evidence upon which the modal statement has been based (Izvorski 1997, von Stechow 2010, Gillies 2010, Matthewson 2011, Kratzer 2012). Nsyilxcen makes a distinction between epistemic modality based on indirect inferential evidence and evidence from reports. The reportative *k^wuk^w* is used to express that the source of evidence is from a report.

- (5) Context: My friend tells me that our friend Jill got married over the weekend. I go to my parents' house. My parents know Jill. I tell them

k^wuk^w Jill c-mrim

REP JILL CONT-GET.MARRIED

'[someone told me] Jill got married'

The conclusions based on these generalizations will show that Nsyilxcen is similar to other Pacific Northwest languages like St'át'imcets and Gitksan in that each modal is strictly assigned one type of modality, epistemic or non-epistemic. Furthermore, like the epistemic modals in these languages *mat* shows variable modal strength. It is permitted in contexts that are compatible with both necessity and possibility interpretations. These modal systems are different from the English system where the modals *must* and *might* are strictly assigned a modal strength but are flexible with respect to the type of modality. Where the Nsyilxcen modal system differs from the St'át'imcets and Gitksan systems is with respect to the modal strength of the second epistemic modal *cmay*. *cmay* is not only strictly an epistemic modal like *mat*, it is also strictly a possibility modal. Unlike *mat*, it does not have variable modal strength.

This thesis will show that Nsyilxcen is not directly similar to any other modal system discussed in this thesis. This is due to how the two epistemic modals behave with respect to their modal strength. *mat* is similar to the St'át'imcets and Gitksan epistemic modals as it is strictly epistemic and shows variable modal strength. However, *cmay* is restricted to contexts that are compatible with possibility readings only; a subset of contexts where *mat* is permitted. These findings call into question the idea that modal systems can be directly compared as a whole across languages based on a simple dichotomy between conversational background and modal force.

Finally, in order to fully document the Nsyilxcen modal system, data for non-epistemic modality is presented in this thesis. Non-epistemic modality covers a

number of modal readings that express possibility and necessity relative to different kinds of facts. These include *deontic* modality, expressing possibility and necessity relative to certain laws; *circumstantial* modality, relative to certain circumstances; *ability*, relative to the abilities of people or entities; *teleological*, relative to achieving a particular goal; and *bouletic*, relative to the desires of an individual. Nsyilxcen has one specialized non-epistemic modal *cak^w* that expresses bouletic modality. As there are no other specialized non-epistemic modals, the speakers paraphrase to express all types of non-epistemic modality by making use of the imperative, irrealis, and the simple bare predicate.

1.1 A guide to the chapters

Chapter 1 - The remainder of chapter 1 provides background information about the Nsyilxcen language, including a section discussing the aspects of the syntax relevant to the Nsyilxcen epistemic modals.

Chapter 2 - Chapter 2 focuses on providing a descriptive overview of the Nsyilxcen modal system. This provides the empirical base for a formal semantic analysis, but also focuses on providing a non-theoretical description that would be useful for non-linguists.

Chapter 3 - Chapter 3 provides an overview of the theory of modality and evidentiality that provided the theoretical tools used to elicit the Nsyilxcen modals. This theory was also used to provide a formal analysis for the modals in Nsyilxcen.

Chapter 4 - Chapter 4 provides the formal semantic analyses for the St'át'imcets, Gitksan, and Nez Perce modal systems which provide a cross-linguistic comparison and base from which the Nsyilxcen system could potentially be analyzed.

Chapter 5 - Chapter 5 proposes three potential formal analyses for the Nsyilxcen epistemic modals. Each option discusses how to account for the strictly encoded modal type and evidential restrictions of *mat* and *cmay* as well as the variable modal strength of *mat* and strictly encoded modal strength of *cmay*.

This thesis explores both epistemic and non-epistemic modality in Nsyilxcen, with particular focus on developing a formal semantic analysis for the epistemic modals *mat* and *cmay*.

1.2 Methodology

The methodology of elicitation involved the collection of primary data through one-on-one interviews with fluent Nsyilxcen consultants. This semantic research

crucially required eliciting felicity judgments from the consultants. Following Matthewson (2004) the task first required collecting complete Nsyilxcen sentences through a translation task from English to Nsyilxcen. These sentences were then paired with a context and the consultants were asked to judge the appropriateness of the sentence within those contexts. Multiple follow up elicitation sessions were conducted in order to discuss how the sentence can be interpreted, why it is or is not correct, how acceptable the utterance is within the presented context, and how to correct the context or the utterance so that it is felicitous. This was done through direct questioning, storyboards, and pictures. Semantic research of this type is of particular importance as these judgments cannot be extracted from texts and must, therefore, be done directly with the speakers.

1.3 Nsyilxcen language background

The Nsyilxcen language, also known as Okanagan, is spoken in south central British Columbia extending from Enderby BC southward through the Okanagan to Kelowna, Penticton and Osoyoos and into north central Washington State in Omak (Lyon 2009). The empirical data for this thesis is based on the Douglas Lake dialect spoken on the Upper Nicola reserve in Merritt, BC (Lyon 2009).

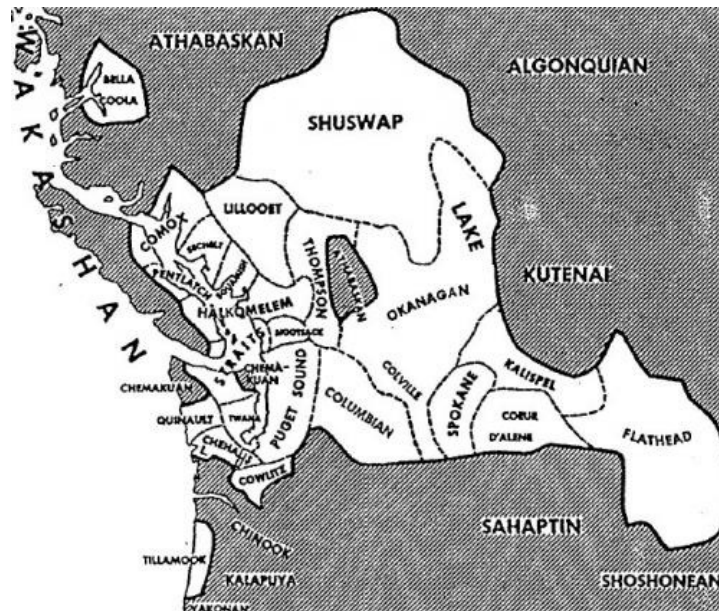


Figure 1.1: Salish language family map (Kroeber 1999: xxxi)

Nsyilxcen is part of the Southern Interior branch of the Salish language family which is comprised of four languages; Okanagan, Moses-Columbian, Coeur d’Alene and the Spokane-Kalispel-Flathead dialect continuum (Lyon 2009). Table 1.1 displays the historical division of the Interior Salish languages (Kroeber 1999).

Table 1.1: Salish language family (Kroeber 1999: 4)

Interior Salish Division	
Northern	St’át’imcets
	Thompson
	Shuswap
Southern	Moses-Columbian
	Colville-Okanagan
	Coeur d’Alene
	Spokane-Kalispel-Flathead

The Ethnologue reports that there are approximately 400 speakers of the Nsyilxcen language, of which there are currently 10 fluent speakers in the Upper Nicola dialect area (Lyon 2011, Lewis 2009). This thesis is based on data from three speakers living in Merritt, BC. Prior research on the Nsyilxcen language has come primarily from Anthony Mattina, who produced numerous research papers (1973-2004), a dictionary for the Colville-Okanagan language (Mattina 1973), and a grammatical sketch of Colville-Okanagan as spoken in eastern Washington (1987). Anthony Mattina also worked in cooperation with Peter Seymour (1974, 1985) documenting narratives, as well as with Clara Jack (1982, 1986, 1992), and Sarah Peterson (1997). Substantial work has also been conducted by Donald Watkins (1970), and Yvonne Hebert (1982), Nancy Mattina (1993-1999), and Maxine Baptiste (2002). Sarah Peterson (2005) is also responsible for producing Okanagan language learning materials. More recently work has been produced by John Lyon and Joel Dunham, PhD students at the University of British Columbia. A. Mattina (1973) recorded and glossed the Nsyilxcen modals in the Colville grammar; however this thesis is the first attempt to provide a semantic analysis for the Nsyilxcen modal system based on the standard semantic modal theory.

1.4 Nsyilxcen syntax

The following section will introduce the aspects of Nsyilxcen syntax that are relevant to the study of the modals discussed in this thesis. It will focus specifically on where the modal particles are found relative to the subject and predicate as well as where the modal particles are found relative to each other in the pre-predicative domain.

To begin, Nsyilxcen allows for flexible word order. N. Mattina (1996) and Lyon (2010, 2012) discuss the permitted word orders for the Nsyilxcen language. Intransitive predicates with overt DP subjects show VS and SV word orders as seen in (6a) and (6b).

- (6) a. *x^w-x^wís-t* *iʔ* *tkłmíl^w*
 RED-walk-STAT DET woman
 ‘The woman started walking’ (Lyon 2010)
- b. *iʔ* *tkłmíl^w* *x^w-x^wís-t*
 DET woman RED-walk-STAT
 ‘The woman started walking’ (Lyon 2010)

For transitive predicates with overt DP subjects and DP objects both SVO (7) and VSO (8) are accepted word orders.

- (7) *iʔ* *sámaʔ* *wik-s* *iʔ* *xíxwtəm*
 DET white.person see-(DIR)-3.SG.ERG DET little.girl
 ‘The white person saw the little girl. / * The little girl saw the white person’
 (Lyon 2010)
- (8) *wik-s* *iʔ* *xíxwtəm* *iʔ* *sámaʔ*
 see-(DIR)-3.SG.ERG DET little.girl DET white.person
 ‘The little girl saw the white person. / * The white person saw the little girl’
 (Lyon 2010)

Lyon (2012) provides an in-depth analysis of non-verbal predicates in Okanagan. He argues that pre-predicative particles structurally must precede the predicate core. These include the modals that will be discussed in this thesis as well as question particles, future markers, and negation. (9) shows that the subject can precede, follow, or appear in between the particle and main predicate string, however the particle must precede the main predicate (Lyon 2012:3).

(9)

- a. *cmay John [c¹q^waq^w]*
MOD John cry
'John might cry' (Lyon 2012)
- b. *cmay [c¹q^waq^w] John*
MOD cry John
'John might cry' (Lyon 2012)
- c. *John cmay [c¹q^waq^w]*
John MOD cry
'John might cry' (Lyon 2012)
- d. * *[c¹q^waq^w] cmay John*
cry MOD John
'John might cry' (Lyon:2012)

I assume that the pre-predicative particles in Nsyilxcen, including the modals, lie in functional projections. Functional projections are the syntactic projections of functional heads like determiners (DP), tense (TP), and aspect (aspP). Cinque (1999) proposes a universal hierarchy of 30 different functional projections for different mood, modal, and aspectual heads. Looking specifically at the modal projections, according to Cinque (1999) the functional projection for necessity modality is structurally higher than that for possibility modality. This appears to coincide with the Nsyilxcen data that will be presented in section (1.4.1), however, more research is necessary to determine whether the other functional projections in Nsyilxcen fit within this functional hierarchy.

(10)

[...
[Mod_{necessity} Necessarily
[Mod_{possibility} Possibly
...]]]

The Nsyilxcen modals listed in (11a-c) are found in the pre-predicative domain of the clause. However, the reportative modal *k^wuk^w* in (11d) shows different syntactic behaviour. Section 1.4.1 will discuss how these modals interact with each other in the pre-predicative domain.

(11)

- a. *mat* - epistemic modal
- b. *cmay* - epistemic modal
- c. *cak^w* - bouletic modal
- d. *k^wuk^w* - reportative

Afterwards, section 1.4.2 will discuss the word order of the modals relative to other pre-predicative particles listed in (12).

(12)

- a. *ha* - question marker
- b. *?uc* - question marker
- c. *lut* - negation

1.4.1 Syntax of epistemic modals in the pre-predicative domain

A. Mattina (1973) describes the pre-predicative particles in table 3.1 as clause particles that modify the clause in which they are found. These are considered independent clause particles which introduce clauses that can stand alone as independent sentences (Mattina 1973: 125). Mattina charts the independent particles in a way that he states reflects the normal order of occurrence of each particle relative to each other. The following table gives Mattina's ordered list of these particles as he presents and translates them (1973: 126).¹

¹Mattina (1973) does not state whether particles that share the same column of table 3.1 are mutually exclusive or freely ordered. Recent elicitations reveal that the modals *mat* (/mt/), and *cmay* (/cm/), are not mutually exclusive and are ordered when they occur together in the same sentence. More research is necessary to determine the relative order of the other particles in each column.

Table 1.2: Independent clause particles (Mattina 1973: 126)

1	2	3	4
háʔ Simple Interrogative	naʃəmł Constrastive	ʔałí ʔ Clausal	cń Probable
ʔúc Dubitative Interrogative	íx ^w Evidential	cał ^w Conditional	mt Conjectural
ʔuł additive			mi Future
			nix ^w Additional

My elicitation on the Douglas Lake dialect of Nsyilxcen has revealed the following ordering of the modals. To begin, (13) shows the permitted word order and permitted stacking of the epistemic modals *mat* (/mt/) and *cmaɣ* (/cń/). (13c) and (13d) show that both epistemic modals can be stacked together in a specific order. (13e) shows that these particles cannot be placed after the predicate.²

(13)

- a. *mat* John sc-kr-mix
 MOD John ASP-SWIM-IMP
 ‘John must be out swimming/ Maybe John is swimming’
- b. *cmaɣ* John sc-kr-mix
 MOD John ASP-SWIM-IMP
 ‘John might be swimming’
- c. *mat cmaɣ* John sc-kr-mix
 MOD MOD John ASP-SWIM-IMP
 ‘Maybe John is swimming’

²Mattina’s (1973) transcriptions write //cń// as cəm and //mt// as mət and he states that schwa epenthesis is predictable. After listening to my primary data, I have decided to transcribe these modals with full vowels. Also, *cmaɣ* was never reduced to cəń during my elicitations. A closer phonetic analysis will be necessary to determine which analysis is more accurate.

- d. * *cmay mat John sc-kr-mix*
 MOD MOD John ASP-SWIM-IMP
 ‘Maybe John is swimming’
- e. * *John sc-kr-mix mat/cmay*
 John ASP-SWIM-IMP MOD/MOD
 ‘Maybe John is swimming’

I do not have data where the predicate precedes the modal and subject, however I predict that it will be incorrect given the data presented in (9d).

- (14) * *sc-kr-mix mat/cmay John* (Not elicited)
 ASP-SWIM-IMP MOD/MOD John
 ‘Maybe John is swimming’

Next, the bouletic modal *cak^w* can only occur in the pre-predicative sphere before the predicate core as seen in (15a) and (15b). Also, *cak^w* cannot co-occur with the epistemic modals *mat* or *cmay* as seen in (15c-d). Sentences presented to the consultants where modals are stacked with *cak^w* were often corrected to contain only one of the modals depending on the context.

- (15)
- a. *cak^w John k^wu-łwín-(n)t-m*
 BOUL.MOD John 1.PL.ABS-leave-DIR-3.SG.ERG
 ‘John should leave us’
- b. * *John k^wu-łwín-(n)t-m cak^w*
 John 1.PL.ABS-leave-DIR-3.SG.ERG BOUL.MOD
 ‘John should leave us’
- c. * *cak^w mat/cmay John k^wu-łwín-(n)t-m*
 BOUL.MOD MOD/MOD John 1.PL.ABS-leave-DIR-3.SG.ERG
 ‘John should leave us’
- d. * *mat/cmay cak^w John k^wúl'-m t pwmin*
 MOD/MOD BOUL.MOD John make-MID OBL drum
 ‘John should be making drums’

Next is the reportative *k^wuk^w*. There is mixed data with respect to the ordering of the epistemic modals relative to the reportative. Data from one consultant in (16) shows that the reportative cannot co-occur with the epistemic modals. However, there is no data from this consultant where *mat* or *cmay* precedes *k^wuk^w*.

(16)

- a. *k^wuk^w* *ks-k^wúl-aʔx* *t* *pwmin*
 REP IRR-make-INCEP OBL drum
 ‘I heard she is going to make a drum’
- b. **k^wuk^w* *cmay* *ks-k^wúl-aʔx* *t* *pwmin*
 REP MOD IRR-make-INCEP OBL drum
 ‘I heard she might make a drum’
- c. **k^wuk^w* *mat* *ks-k^wúl-aʔx* *t* *pwmin*
 REP MOD IRR-make-INCEP OBL drum
 ‘I heard she might make a drum’

Data from a second consultant in (17) reveals that the epistemic modals and the reportative *k^wuk^w* can be stacked together in the same sentence.

(17)

- a. *k^wuk^w* *cmay* *k^wʔwin-(n)t-m* *kl* *England*
 REP MOD go-DIR-3.SG.ERG LOC England
 ‘I heard he might go to England’
- b. *cmay* *k^wuk^w* *k^wʔwin-(n)t-em* *kl* *England*
 MOD REP go-DIR-3.SG.ERG LOC England
 ‘I heard he might go to England’
- c. *k^wuk^w* *mat* *k^wʔwin-(n)t-em* *kl* *England*
 REP MOD go-DIR-3.SG.ERG LOC England
 ‘I heard he might go to England’
- d. *mat* *k^wuk^w* *k^wʔwin-(n)t-em* *kl* *England*
 MOD REP go-DIR-3.SG.ERG LOC England
 ‘I heard he might go to England’

(18) shows that the reportative has different syntactic behaviour from the epistemic and bouletic modals as it can occur after the predicate core.

(18)

- a. *John k^wuk^w c'aʔ-nt-ís iʔ kəkʷáp*
 John REP hit-TRANS-3.SG DET dog
 'I heard John hit the dog'
- b. *John c'aʔ-nt-ís k^wuk^w iʔ kəkʷáp*
 John hit-TRANS-3.SG REP DET dog
 'I heard John hit the dog'
- c. * *John c'aʔ-nt-ís mat iʔ kəkʷáp*
 John hit-TRANS-3.SG MOD DET dog
 'John must have hit the dog'

As this data shows, *mat* and *cmay* have a fixed ordering where *mat* must always precede *cmay*. Recall from section (1.4) that this ordering fits with Cinque's predicted ordering for necessity and possibility modals. Secondly, *mat* and *cmay* are mutually exclusive with respect to the bouletic modal *cak^w*. Finally, according to one speaker, the reportative can be stacked with the epistemic modals and can precede and follow both *mat* and *cmay*. Table 1.3 summarizes these generalizations. Items in the table that share a column are mutually exclusive.

Table 1.3: Order of Nsyilxcen modals

k ^w uk ^w	mat	cmay	k ^w uk ^w
cak ^w			

1.4.2 Syntax of pre-predicative particles and epistemic modals

Next, I looked at how the epistemic modals stack relative to other pre-predicative particles listed in (19).

(19)

- a. *ʔuc* - question marker
 b. *ha* - question marker

c. *lut* - negation

To begin, the question particle *ha* has been labeled as the interrogative particle (Mattina 1973) and the yes/no question particle (Lyon 2012). (20) shows that the question particle belongs to the pre-predicative domain as it also cannot be preceded by the predicate (Lyon 2012:26).

(20)

- a. **ha** [yam^{xw}aʔ NP] *ixiʔ*
 YNQ basket DEM
 ‘Is that a basket?’ (Lyon 2012: 26)
- b. **ha** *ixiʔ* [yam^{xw}aʔ NP]
 YNQ DEM basket
 ‘Is that a basket?’ (Lyon 2012: 26)
- c. *ixiʔ* **ha** [yam^{xw}aʔ NP]
 DEM YNQ basket
 ‘Is that a basket?’ (Lyon 2012: 26)
- d. * [yam^{xw}aʔ NP] **ha** *ixiʔ*
 basket YNQ DEM
 ‘Is that a basket?’ (Lyon 2012: 26)

Relative to the epistemic modals, (21) shows that the question particle *ha* can precede or follow *mat* and (22) shows that *ha* can only precede *cma*. This provides further evidence that *mat* is located higher than *cma* in the pre-predicative domain.

(21)

- a. **mat ha** *Brian k^wu-ks-k-xiʔ-nt-m*
 MOD YNQ Brian 2.PL.ABS-IRR-RES-COME-TRANS-3.SG.ERG
 ‘Is Brian going to come with us?’
 ‘I wonder if Brian is going to come with us?’
- b. **ha mat** *Brian k^wu-ks-k-xiʔ-nt-m*
 YNQ MOD Brian 2.PL.ABS-IRR-COME-TRANS-3.SG.ERG
 ‘Is Brian going to come with us?’
 ‘I wonder if Brian is going to come with us?’

(22)

- a. *ha cmay ilx^w in-kəkwáp*
YNQ MOD hungry POSS-dog
'Is my dog hungry?'
- b. **cmay ha John sx^wmámáyaʔm*
MOD YNQ John teacher
'Is John a teacher?'

There is a second question particle *ʔuc* which has been labeled as the dubitative question particle (Mattina 1973). *ʔuc*, similar to interrogative *ha*, can only precede *cmay* as seen in (23a) and (23b) but can both precede and follow *mat* as seen in (23c) and (23d). The translations of the sentences and their felicity do not change relative to where the question particles are found.

(23)

- a. *ʔuc cmay Brian k^wu-ks-k-xiʔ-nt-m*
Q MOD Brian 2.PL.ABS-IRR-RES-COME-TRANS-3.SG.ERG
'Is Brian going to come with us?'
- b. **cmay ʔuc Brian k^wu-ks-k-xiʔ-nt-m*
MOD Q Brian 2.PL.ABS-IRR-RES-COME-TRANS-3.SG.ERG
'Is Brian going to come with us?'
- c. *ʔuc mat Brian k^wu-ks-k-xiʔ-nt-m*
Q MOD Brian 2.PL.ABS-IRR-RES-COME-TRANS-3.SG.ERG
'Is Brian going to come with us?'
- d. *mat ʔuc Brian k^wu-ks-k-xiʔ-nt-m*
MOD Q Brian 2.PL-IRR-RES-COME-TRANS-3.SG.ERG
'Is Brian going to come with us?'

Finally, the negation particle *lut* is found preceding and following the modals *mat* and *cmay* as shown in (24) and (25). There is no difference in the translation relative to where the negation particle is found.

(24)

- a. *lut mat λx^wup iʔ Canucks*
NEG MOD WIN DET CANUCKS
‘The Canucks must not have won’
- b. *mat lut λx^wup iʔ Canucks*
NEG MOD WIN DET CANUCKS
‘The Canucks must not have won’

(25)

- a. *cmay lut ks-qíc-əlx*
MOD NEG FUT-RUN-LEX
‘I might not run’
- b. *lut cmay ks-qíc-əlx*
NEG MOD FUT-RUN-LEX
‘I might not run’

Summarizing, my elicitations from the Douglas Lake dialect suggest that the order of the epistemic modals relative to the other pre-predicative particles appears to be flexible with a few fixed orderings. Table 1.4 puts these findings into order.

Table 1.4: Order of epistemic modals and pre-predicative particles

lut	ʔuc ha	mat	ʔuc ha	cmay	lut
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The data presented in this section was intended to give the syntactic ordering of the pre-predicative domain in Nsyilxcen with specific focus on the epistemic modals. More research is necessary to determine the syntactic ordering of the entire pre-predicative domain in Nsyilxcen. Furthermore, this data is based on what surface word orders are permitted and not permitted by consultants. This data does not consider a more abstract syntactic structure that accounts for the different base-generated positions plus movements.

Chapter 2

Nsyilxcen Modality

There are four specialized modals in Nsyilxcen; three epistemic modals, *mat*, *cmay*, and *k^wuk^w* and one non-epistemic bouletic modal *cak^w*. Deontic, teleological, ability, and pure circumstantial modality are expressed by using the imperative, irrealis as well as the bare predicate. Table 2.1 summarizes the Nsyilxcen modal system for the Douglas Lake dialect.

Table 2.1: Nsyilxcen modality

Epistemic		
Modal	Translation	Gloss
mat	must/might/maybe	Epistemic
cmay	might/maybe	Epistemic possibility
k^wuk^w	‘I heard’/ ‘Someone told me’	Reportative
Non-Epistemic		
Modal	Translation	Gloss
cak^w	‘should’, ‘would’, ‘wish’	Bouletic
x and -ik	Transitive imperative and intransitive imperative	Deontic, Teleological
ks-	Irrealis	Deontic, Teleological
∅	Bare predicate	Deontic, Teleological, Ability, Circumstantial

The present chapter introduces the basic features of the Nsyilxcen modal system. Section 2.1 discusses A. Mattina’s (1973) data for the modals discussed in his thesis. Section 2.2 summarizes how Nsyilxcen expresses epistemic modality, providing data and generalizations for *mat* and *cmay* and for the reportative modal *k^wuk^w*. Finally, section 2.3 discusses how Nsyilxcen speakers express non-

epistemic modality. It defines each type of non-epistemic modality and provides a separate section for each particle used to express non-epistemic modality.

2.1 Colville-Okanagan modality: A. Mattina 1973

Anthony Mattina’s thesis on the grammatical structure of Colville-Okanagan lists the modal particles in their underlying form and provides a translation for each (A. Mattina 1973). Table 2.2 provides Mattina’s description of the pre-predicative modal particles in their underlying form.

Table 2.2: Modal particles (A. Mattina 1973)

Translation	Modal Particle
Probable	//cɹ́m//
Conjectural	//mt//
Conditional	//cak ^w //

Mattina (1973) describes //cɹ́m// as a particle that marks the proposition as probable. //mt// marks the proposition as possible but in doubt (Mattina 1973: 135). However, the examples provided in (26) and (27) from Mattina (1973) suggest that the inverse is true, where //cɹ́m// expresses possibility and //mt// expresses probability.³

- (26) *cə́m ct-əlx lut*
 MOD say-3.PL.ERG NEG
 ‘They **might** say: no’ (Mattina:1973)

- (27) *mət tw-m-í-s-t-(í)s myrtle*
 CONJECTURAL sell-MIDDLE-SECONDARY-CAUSATIVE-TRANSITIVE-SHE Myrtle
ýi citx^w-s
 ...DEFINITE house-HERS
 ‘Myrtle’s house **must** have been sold’ (Mattina:1973)

My fieldwork on the Douglas Lake dialect has revealed that //cɹ́m//, produced by the speakers as *cmaɹ*, expresses solely notions of possibility and doubt, and //mt//, presented as *mat* here, expresses notions of possibility and doubt, but also covers stronger modal notions of probability and necessity.

³ *cmaɹ* alternates with the form *cə́m*.

A. Mattina (1973) labels the modal particle *cak^w* as a conditional expressing notions of ‘should’, ‘would’, or ‘wish’. My fieldwork revealed similar translations which will be presented in section 2.3.1.⁴

(28) *cak^w sulɪŋckícx*
 ‘Wish that Julie would get here’ (Mattina 1973: 134)

(29) *cak^w ʔláʔ kiʔ nəŋcúsəntəm*
 ‘We should set a trap for it right here.’ (Mattina 1973: 134)

2.2 Nsyilxcen epistemic modality: The Douglas Lake dialect

Epistemic modality is the expression of possibility and necessity given the speaker’s knowledge and beliefs. The three Nsyilxcen particles used to express epistemic modality are repeated in table 2.3.

Table 2.3: Nsyilxcen epistemic modals

Modal	Translation	Gloss
mat	Must, might, maybe	Epistemic Necessity, Epistemic Possibility (EPIS)
cmay	Might, maybe	Epistemic Possibility (EPIS.POSS)
k^wuk^w	I heard, Someone told me	Reportative (REP)

To begin, *mat* and *cmay* express epistemic modality and are felicitous in contexts where the speaker is making an inference about the situation at hand based on their previous knowledge, beliefs, and experiences. Where these two modals differ is based on their modal strength, whether they are felicitous in necessity or possibility contexts. A necessity context is one where the speaker is more certain about the truth of a proposition based on strong evidence or reasoning. This can either mean that the speaker has convincing physical evidence available to them or the speaker has a lot of previous knowledge about the situation at hand. Often any type of physical evidence whether it is visual, auditory or olfactory evidence will

⁴There are no morpheme glosses for (28) and (29) in Mattina (1973).

serve to strengthen the context resulting in a necessity interpretation. A strong necessity context is one where the English modal *must* is used. In (30), the bloody handprints, footprint, and murder weapon close to the window, and the fact that the window was open and the door was locked from the inside is strong evidence that the murderer escaped out the window.

(30) Context: You are a detective in a murder case. In the room where the murder took place, the only door was bolted on the inside. However you see bloody handprints on the window sill, footprints just outside the window, and a dropped knife outside the window which is probably the murder weapon.

✓ He must have escaped out the window

?? He may have escaped out the window

A possibility context is one where the speaker is less certain about the truth of the proposition. This could be due to the presence of poor physical evidence or the fact that the speaker cannot make a strong statement based on their intuition or reasoning because there are too many options that could be true. In (31), there is evidence of a footprint outside the window but the speaker cannot deduce that the murderer escaped that way because there were other ways out of the room and the murderer left no trace.

(31) Context: You are a detective in a murder case. In the room where the murder took place, there are several doors, all of which were unlocked when the police arrived. There are no fingerprints anywhere, and no sign of a murder weapon, but you see a faint footprint just outside the window. You say:

?? He must have escaped out the window

✓ He may have escaped out the window

During elicitation, pairs of contexts like (30) and (31) were presented to the consultant. These contexts, and variations of the contexts were paired with Nsyilxcen modal sentences to elicit felicity judgments and translations. The examples presented here are those that were consistently judged as good or bad within each context.⁵ Any speaker comments are provided below the examples and are often

⁵Due to the complexity of the contexts presented to the speakers, some variability in judgments occurred. The majority of variability was between the different speakers. Any variability between the answers of individual speakers were reconciled by clarifying the contexts and checking the data and contexts over a number of elicitation sessions.

insightful as to whether the speaker believed the context was compatible with a necessity interpretation or a possibility interpretation.

Take into consideration the following Nsyilxcen data. In (32), the speaker is making an inference about Mary's whereabouts. In this case there are multiple places that Mary could be at the present moment; running, shopping or at school. In this context both *mat* and *cmay* are felicitous and are translated as *might*. The speaker is stating that, based on their knowledge about Mary's schedule and interests, it is a possibility that Mary is running at the present moment.

(32) Context: You know that Mary loves to go running and often goes on runs randomly. She could also be at the store or at school. I ask you, where is Mary?

a. Mary *mat* *ac-qíc-əlx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'

b. Mary *cmay* *ac-qíc-əlx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'

However, the possibility context in (32) stands in opposition to the necessity context in (33) where the speaker has more information about Mary. In this case, the speaker knows that Mary has a strict training schedule and runs every Tuesday at 6pm. Because of the strict nature of her exercise regime this context is much stronger than if she runs randomly during the week and, as a result, the speaker makes a stronger modal statement. In this context *mat* is again felicitous but with a necessity *must* translation. *cmay* on the other hand is now infelicitous and the speaker comments that *cmay* is inappropriate in this context because it is used to make a guess.

(33) Context: Mary runs every day to train for a marathon. She usually runs at 6pm on Tuesdays. Today is Tuesday and it's 6pm. I ask you, where is Mary?

a. Mary *mat* *ac-qíc-əlx*
Mary EPIS.MOD CONT-RUN-LEX
'Mary must have went running'

- b. # *Mary cmay ac-qíc-əlx*
 Mary EPIS.MOD CONT-RUN-LEX

'Mary might be running'

Consultant comment: 'cmay. We are just guessing. Mary might be running.'

The generalization based on this data is that the epistemic modals *mat* and *cmay* are distinguished by their modal strength. *mat* is variable and is permitted in both necessity and possibility contexts and *cmay* is restricted to possibility contexts. To elicit this difference in strength, different contexts were presented to the speakers which were designed to specifically elicit a stronger necessity modal claim or weaker possibility modal claim.

(34) shows that *mat* and *cmay* are both felicitous in a context where there is a degree of uncertainty. This context was set in a larger discussion about how unusually cold the summer had been and how the berries may ripen later than usual. As a result the speaker is unsure whether the berries are ripe or not.

- (34) Context: You know that the berries in the Okanagan are usually ripe in July. You don't know if the berries are ripe right now but, since it is July then based on your knowledge the berries might be ripe.

- a. *mat p'y'aq iʔ sia ʔapnáʔ*
 EPIS.MOD ripe DET berries now

'The berries might be ripe now'

- b. *cmay p'y'aq iʔ sia ʔapnáʔ*
 EPIS.MOD ripe DET berries now

'The berries might be ripe now'

(35) provides an example with visual evidence where the speaker can reason with certainty that John is going hunting based on the fact that he is wearing his hunting gear and is holding a gun. As a result *mat* is permitted with a necessity translation and *cmay* is infelicitous.

- (35) Context: Our friend John has been talking about going hunting for weeks. One day we see John with camouflage clothing on and a gun in his hand.

- a. *mat* *ks-c-piḥ-aʔx*
 EPIS.MOD IRR-CUST-hunt-INCEP
 ‘He must be going hunting’
- b. # *cmay* *ks-c-piḥ-aʔx*
 EPIS.MOD IRR-CUST-hunt-INCEP
 ‘He must be going hunting’

The following context (36) has been translated as both a possibility and necessity context. When *mat* was translated as *must* the speaker’s comment indicated that she was interpreting it as a necessity context. On a separate occasion, the fact that *mat* was translated as *might* and that *cmay* is felicitous indicates that (36) can also be a possibility context.

(36) Context: Our friend John has been talking about going hunting for weeks. One day John isn’t around. Where is John?

- a. *mat* *ks-c-piḥ-aʔx*
 EPIS.MOD IRR-CUST-hunt-INCEP
 ‘He might be going hunting’
- b. *mat* *ks-c-piḥ-aʔx*
 EPIS.MOD IRR-CUST-hunt-INCEP
 ‘He must be going hunting’

Consultant (LL): He must have got up and left before anyone else got up.

- c. *cmay* *ks-c-piḥ-aʔx*
 EPIS.MOD IRR-CUST-hunt-INCEP
 ‘He might be going hunting’

(37) provides a context with poor physical evidence. The speaker is directly looking at John down the beach but because she has poor eye-sight and cannot see clearly, she must infer it is John based on her knowledge about John’s appearance. In this case both *mat* and *cmay* are felicitous with possibility *might* translations as the speaker cannot be sure that the blurry vision of the man down the beach is in fact John.

(37) Context: Sarah is walking down the beach and sees someone walking towards her far away. She forgot her glasses at home and can't make out who it is, but it looks like it might be John.

a. *mat* *ixlʔ* *John*
 EPIS.MOD DEM John
 'That might be John'

b. *cmay* *ixlʔ* *John*
 EPIS.MOD DEM John
 'That might be John'

Evidence can also be auditory and can serve to strengthen the context. In (38) a growling stomach is a strong indication that I am hungry. When epistemic contexts contain strong sensory evidence *cmay* is infelicitous, and *mat* elicits a necessity translation.

(38) Context: We are working away and my stomach starts to growl. You think, she must be hungry.

a. *mat* *talí* *ʔilxʷt*
 EPIS.MOD very hungry
 'She must be hungry'

b. # *cmay* *talí* *ʔilxʷt*
 EPIS.MOD very hungry
 'She might be hungry'

Consultant: With *cmay* it means maybe she is hungry. It's like you are asking or curious. You can't say that if you hear her stomach growl.

(39) shows that *cmay* is only permitted if context (38) is changed to a weaker epistemic context where the speaker has no evidence and is uncertain about whether I am hungry. In this case both *mat* and *cmay* are felicitous with possibility translations.

(39) Context: You don't hear my stomach growling and I'm not in the room. It is supper time and we have been working for a while.

- a. *mat* *talí* *ʔilx^wt*
 EPIS.MOD very hungry
 ‘She might be hungry’
- b. *cmay* *talí* *ʔilx^wt*
 EPIS.MOD very hungry
 ‘She might be hungry’

In contexts (40-41) the same visual evidence is presented to a father and son who have different background knowledge and experience through which they are evaluating the situation at hand. However, because the father has more background knowledge about what the evidence tells him he can be more certain that the proposition ‘a bear came by here’ is true. The father can use *mat* which is translated as *must*, and *cmay* is infelicitous.

(40) Context: A father is taking his young son out to teach him how to hunt. The son doesn’t know much about hunting or tracking animals. His dad is very good at hunting and tracking and he is teaching his son everything he knows about tracking animals. They come across a broken branch on the trail and the leaves of the nearby bush have been flattened. These are signs that a large animal like a bear has been by this way. The father says:

- a. *mat* *atáʔ* *xiʔwílx* *iʔ* *skəmxíst*
 EPIS.MOD DEM walk.by DET bear
 ‘A bear must have come by here’
- b. # *cmay* *atáʔ* *xiʔwílx* *iʔ* *skəmxíst*
 EPIS.MOD DEM walk.by DET bear
 ‘A bear might have come by here’

The son on the other hand, has less background knowledge about hunting and tracking animals so the son is less certain that a broken branch means a bear came by this way. This context was presented to the speaker in a way that focused on the fact that the son does not know what type of animal created the damage that he sees. As a result both *mat* and *cmay* are permitted and can be translated as *might*.

(41) Context: A father is taking his young son out to teach him how to hunt. The son doesn't know much about hunting or tracking animals. His dad is very good at hunting and tracking and he is teaching his son everything he knows about tracking animals. They come across a broken branch on the trail and the leaves of the nearby bush have been flattened. The little boy is not sure what kind of animal came by this way. The son says:

a. *mat* *ataʔ xiʔwɪlx iʔ skəmxɪst*
 EPIS.MOD DEM walk.by DET bear

'A bear might have come by here'

b. *cmay* *ataʔ xiʔwɪlx iʔ skəmxɪst*
 EPIS.MOD DEM walk.by DET bear

'A bear might have come by here'

The Nsyilxcen data in this section provides support for the claim that *mat* and *cmay* are both epistemic modals. The data also shows that *mat* is permitted in contexts that are compatible with both necessity and possibility translations. This is opposed to *cmay* which is only permitted in contexts that are compatible with possibility translations. The next section will discuss that *mat* and *cmay* also have an evidential restriction expressing that the speaker is basing the modal statement on indirect inferential evidence. Furthermore, section 2.3.4 will show that *mat* and *cmay* are only permitted in epistemic contexts and are infelicitous in non-epistemic contexts.

2.2.1 Source of evidence and Nsyilxcen epistemic modals

As discussed by von Stechow and Gillies (2010) and Matthewson (2011) among others, epistemic modals can specify the source of evidence. Willett (1988) defines *direct evidence* as claims about situations that were directly perceived by the speaker and *indirect evidence* as claims about situations that are *not* directly perceived by the speaker. Modal statements using *mat* and *cmay* specifically encode an indirect evidential restriction and are not used if the situation was witnessed directly. *mat* and *cmay* are infelicitous in contexts where the speaker has direct evidence of the action or event as seen in (42b) and (42c).

(42) Context: I look outside and see that it is raining.

- a. *way s-c-ḡitx*
 AFF NOM-CUST-rain
 ‘Yes, It is raining’
- b. # *mat s-c-ḡitx*
 EPIS.MOD NOM-CUST-rain
 ‘It must/might be raining’
- c. # *cmay s-c-ḡitx*
 EPIS.MOD NOM-CUST-rain
 ‘It might be raining’

The Nsyilxcen epistemic modals also make a division between indirect evidence based on inference and indirect evidence based on a report. This fits with Willett’s (1988) cross-linguistic evidential typology which will be discussed in section 3.2. The Nsyilxcen has a third specialized reportative modal *k^wuk^w* used to express that the source of evidence comes through a report from another person. In contexts where the speaker did not directly witness the event being reported, the reportative *k^wuk^w* is felicitous as seen in (43). However, *k^wuk^w* is infelicitous when the speaker has directly witnessed the event as shown in (44).

- (43) Context: My friend Tessa saw Sarah kiss Rodger and she tells me about it. I then tell you what I heard from Tessa.

k^wuk^w Sarah ʼimʔas Roger
 REP Sarah kiss Roger
 ‘[someone said] Sarah kissed Roger’

- (44) Context: My friend Tessa saw Sarah kiss Rodger and she tells me about it. I also saw Sarah kiss Rodger. I then tell you what I heard from Tessa.

k^wuk^w Sarah ʼimʔas Roger uʔ wik-n
 REP Sarah KISS Roger and see-1.SG.ERG
 ‘Someone said that Sarah kissed Roger and I saw it’

The following examples (45) and (46) show the same result. (46) is infelicitous because the speaker was present at the wedding and witnessed Jill get married.

- (45) Context: My friend tells me that our friend Jill got married over the weekend. I go to my parents' house. My parents also know Jill. I tell them.

k^wuk^w *c-mrim* Jill
 REP CONT-married Jill

'I heard Jill got married'

- (46) Context: I was at Jill's wedding, I saw them get married and helped them celebrate. John didn't see me there so he tells me "Hey! Jill got married". I tell my parents.

k^wuk^w Jill *c-mrim*
 REP Jill CONT-married

'I heard Jill got married'

Consultant: You can't say that if you were there

- (47a) and (47b) show that *mat* and *cmay* are infelicitous in such contexts and cannot be translated as a report.

- (47) Context: My friend tells me that our friend Jill got married over the weekend. I go to my parents' house. My parents know Jill. I tell them

a. # Jill *mat* *c-mrim*
 Jill EPIS.MOD CUST-get.married

'Jill might have gotten married'

b. # Jill *cmay* *c-mrim*
 Jill EPIS.MOD CUST-get.married

'Jill might have gotten married'

As the Nsyilxcen data shows, the epistemic modals *mat* and *cmay* express necessity and possibility as well as an evidential restriction specifying the speaker was using indirect inference from previous knowledge, beliefs, and experience. This is opposed to *k^wuk^w* which specifies a reportative evidential restriction and is used to express that the source of evidence comes indirectly through a report.

I propose that *mat* and *cmay* are distinguished from each other with respect to their differences in modal strength. *mat* is permitted in contexts that allow for both necessity and possibility interpretations. *cmay* is restricted to contexts that allow for possibility interpretations only. Whether it is a necessity or possibility context is connected to the strength of the evidence available to the speaker.

2.3 Nsyilxcen non-epistemic modality

This section aims to document how Nsyilxcen speakers express non-epistemic modal readings. Non-epistemic readings express necessity and possibility over worlds that are compatible with a deontic, circumstantial, bouletic, ability, or teleological conversational background. Each type of non-epistemic modality is defined in (48) (von Stechow 2006).

(48)

- a. *Ability* - Expresses possibility given the physical limits of a particular person or thing.
- b. *Bouletic* - Expresses possibility and necessity given a person's desires.
- c. *Circumstantial* - Expresses possibility and necessity given particular circumstances.
- d. *Deontic* - Expresses possibility and necessity given what is permitted or obligatory given a set of laws, regulations or moral principles.
- e. *Teleological* - Expresses what is possible and necessary for achieving a goal.

Table 2.4 lists Nsyilxcen particles that have been elicited in non-epistemic contexts. The first is a modal *cak^w*, the second two are imperative markers, the third is the irrealis marker, and finally the speakers can simply use the basic predicate.

Table 2.4: Nsyilxcen particles in non-epistemic contexts

Nsyilxcen	Gloss	Context
cak^w	'should', 'would', 'wish'.	Bouletic
x and -ik	Transitive imperative and intransitive imperative	Deontic, Teleological
-ks	Irrealis	Deontic, Teleological
\emptyset	Bare predicate	Deontic, Teleological, Ability, Circumstantial

My fieldwork on the Douglas Lake dialect shows that there is only one non-epistemic modal **cak^w**, which is used in bouletic contexts. Because Nsyilxcen speakers do not have deontic, teleological, ability, or circumstantial modals they have other

ways of paraphrasing. The irrealis *ks-* is felicitous in deontic, teleological, circumstantial, and ability contexts. The irrealis is a grammatical category indicating that a situation has not yet occurred at the time of utterance. The imperative, a grammatical form often used in commands, is permitted in permission contexts. Finally, Nsyilxcen speakers can use the basic predicate in deontic and ability modality contexts. The following sections provide data for each of the particles and discusses how each can be used to express non-epistemic modality in Nsyilxcen.

2.3.1 *cak^w* bouletic modal

cak^w is a bouletic modal and is used to express the speaker's wishes and desires. Examples (49-51) provide contexts eliciting a bouletic conversational background. In (49), based on the Olympian's desire to remain unhurt, he should drop the weights.

- (49) Context: We are watching the weight lifting category during the Olympics. We see an athlete holding a very heavy weight above his head. He is shaking very hard, if he doesn't drop it soon his arms are going to give out. I say to you:

cak^w *yx^wmi-s*
BOUL.MOD drop-3.SG.ERG
'He should drop it'

In (71), based on the speaker's desire for more meat, it is necessary that John goes hunting.

- (50) Context: We running low on meat supplies and need to get more so we can make it through the winter. You say that John should go hunting.

cak^w *ac-piḥ-m*
BOUL.MOD CUST-hunt-MID
'He should go hunting'

Finally in (51), based on the general traits and our desires for a good teacher, it is necessary that a teacher is smart.

- (51) Context: We are discussing the traits that a teacher should have.

cak^w *sisyús iʔ scmaʔmáyaʔm*
 BOUL.MOD smart DET teacher

‘A teacher must/should be smart’

Context (52) presents as weak necessity context where the speaker’s goal is to reach Penticton from Merritt in the fastest way possible. The speakers use the bouletic modal *cak^w* to express that if the speaker’s desire is to achieve their goal of getting to Penticton quickly then they should take the car.

- (52) Context: I am in Merritt and am trying to get home to Penticton quickly. You know that the train takes a very long scenic route, and the bus stops a lot and takes a very long time. You tell me, “If you want to get home quickly, you should take your car’

k^w-s-x^ws-lx *x^wuy. cak^w* *lan automobile ki* *kł-x^wuy*
 2.SG.ABS-NOM-rush-LEX GO BOUL.MOD LOC car COMP IRR-GO

‘You are in a rush. You should take your car when you go’

When elicited in epistemic contexts, *cak^w* is infelicitous or corrected to a bouletic translation as seen in (53).

- (53) Context: You and a friend are at the store and you see a dollar coin on the ground. It could be yours, your friend’s, or the person in front of you in line may have dropped it.

cak^w *yx^wmi-nt-s*
 BOUL.MOD drop-TRANS-3.SG.ERG

‘He might/must have dropped it’

When *mat* or *cmay* are elicited under a bouletic context, the translation changes to one where the speaker is making an inference. The consultant’s comment that it sounds like the speaker is guessing indicates that it is no longer a bouletic statement.

- (54) Context: My sister hurt her leg. The doctor says that she should not walk on it for a week.

a. *lut mat* *t’-ks-x^wisc*
 NEG EPIS.MOD EMPH-IRR-walk

‘She might not walk’

- b. *cmay* *t'-ks-x^wisc*
 EPIS.MOD EMPH-IRR-walk
 'She must walk'
Consultant comment: 'You are guessing'
- c. *cak^w* *t'-ks-x^wisc*
 BOUL.MOD EMPH-IRR-walk
 'She should not walk'

As discussed by Mattina (1973), *cak^w* is used to express notions of 'should', 'would', or 'wish'. These notions can be classified under the bouletic non-epistemic modality label.

2.3.2 -*ks* irrealis

The irrealis marker *-ks* can be used to express deontic, teleological, circumstantial, and ability modality. First, deontic modality expresses possibility and necessity given what is permitted or obligatory given a set of laws, regulations, or moral principles (von Stechow 2006). Examples (55) and (56) present deontic necessity contexts where a mother has authority over her daughter and is enforcing the rules of her household. In a context where the mother is speaking directly to the daughter the irrealis can be used.

- (55) Context: Mary's mother has told Mary that she must finish three chores before she can play with her friends. (TFS Working Group 2011) ⁶

cú(n)-nt-əm "*lut kaʔʔís a-kʰ-s-k^w'ul'əm* *sic k^w-c-iʔíckən*"
 say-TRANS-MID "NEG, three 2.SG.POSS-IRR-NOM-work then 2.SG.ABS-CUST-play"

'She said "No, you will do three chores before you play" '

In example (56) the little girl is telling her friends that she is not permitted to go play because she must finish her three chores.

⁶This data was elicited using the story *Chore Girl* developed by *Totem Fields Storyboards* team: TFS Working Group (2011). *Chore Girl*. Retrieved from http://totemfieldstoryboards.org/stories/chore_girl/ on Oct 25, 2012.

- (56) Context: The little girl’s friends come by and ask her to go out and play with them. She informs them that her mother says she can’t go outside because she has to/must finish her chores (TFS Working Group 2011).

lut ks-ac-iʔickən mi wiʔ-st-in-s-kʷlmi sic
 NEG IRR-CUST-play FUT finish-TRANS-1.SG.POSS-NOM-chores then
kn-ac-ʔickn
 1.SG.ABS-CUST-play

‘No, I will not play, I will finish my chores, then play’

In context (57) the doctor is speaking to my mother about my little sister, giving an order that my little sister must stay off of her broken leg.

- (57) Context: My little sister broker her leg. The doctor said to my mom that she is not permitted to walk on it so that it has a chance to heal.

lut aʔ-ks-xʷi-stc
 NEG ASP-IRR-walk-CAUS

‘She will not walk’

Example (58) is a negated deontic possibility context, where Mary has finished her chores and is given permission to go outside. In this context the mother is speaking directly to the daughter.

- (58) Context: Mary has finished all of her chores so her mom says, ”you can go outside and play” (TFS Working Group 2011).

cu(n)-nt-əm iʔ t tuʔns “way ks-xuy-ʔax. ʔickn-x”
 say-CTR-MID DET OBL woman’s.mother “yes, IRR-go-INCEP. play-IMP”

‘Her mother said “yes, you will go play”

From the first person point of view the little girl is expressing that she is permitted to go out and play.

- (59) Context: Mary says to her friends that she is allowed to go outside and play (TFS Working Group 2011).

way kn ks-ʔickn-aʔx ʔapanáʔ
 AFF 1.SG.ABS IRR-play-INCEP NOW

‘Yes, I can go play now’

Next, teleological modality expresses the necessary or possible means for achieving a goal (von Fintel 2006). Context (60) is a necessity context where there is no other option to achieve the goal of getting to Penticton.

- (60) Context: I am in Merritt and am trying to get home to Penticton. I find out that the Greyhound is not running from Penticton to Merritt anymore. You say to me “In order to get home, you have to take a car” (There is no bus option, there is no train option)

ʔ(a)-an-ʔmínk a-ks-xʷuy lan automobile mi kʷ-ʔ-xʷuy
 COMP-2.SG.POSS-want 2.SG.POSS-IRR-go LOC car FUT 2.SG.ABS-DIR-go

‘If you want to go home, you will take your car’

Context (61) provides a possibility context, where there are many options for getting to Penticton; by train, bus, or car. The speaker suggests to the addressee that they can take the bus.

- (61) Context: I am in Merritt and want to get to Penticton. There are many options for getting there; train, bus, or car. You tell me that I can take the bus.

ʔan-xamink aʔ-ks-xʷuy n-ʔmut iʔ l bus kʷu-xʷuy
 2.SG.POSS-want ASP-IRR-go PART-sit DET LOC bus 2.SG-go

‘You want to go. Take the bus to go’

The irrealis can also be used to express circumstantial modality, which expresses necessity and possibility given a certain set of circumstances. The following examples provide a circumstantial context based on Kratzer’s (1991) hydrangeas example. The context that Kratzer presents is used to distinguish between circumstantial and epistemic modality. Kratzer’s example is provided in (62).

- (62) Context: Suppose I acquire a piece of land in a far away country and discover that soil and climate are very much like at home, where hydrangeas prosper everywhere. Since hydrangeas are my favourite plants, I wonder whether they would grow in this place and inquire about it.

- a. Hydrangeas can grow here.
- b. There might be hydrangeas growing here.

In this context, (62a) can be true whether or not there are hydrangeas already in existence. It does not make a statement about whether there are already hydrangeas growing there. All that matters is the type of soil, climate, and the properties of the hydrangeas. (62b) on the other hand is only true if the evidence in the actual world indicates that hydrangeas are growing there. It would be false if the evidence is not compatible with the growth of hydrangeas in the actual world. A similar context was presented to the Nsyilxcen consultants. Examples (64) and (65) provide other circumstantial examples.

- (63) Context (Circumstantial): My mother is buying plants in Vancouver to grow in Penticton. Penticton has a very dry climate, which is very different from Vancouver which has a very wet climate. My mom asked if these plants will grow in Penticton, given the temperature, weather, and soil in Penticton. The sales person says:

way', ks-pl-míxaʔx iʔ snpintkn
 AFF, IRR-GROW-INCEP DET penticton

‘Yes, the flowers will grow in Penticton’

Example (64) provides another circumstantial context where the irrealis particle is felicitous. Given the fact that I am strong enough to climb the cliff then my sister, being stronger than I am, is also strong enough to climb the cliff.

- (64) Context: My sister and I are rock climbing together. My sister is much stronger and better at climbing than I am. If I am able to climb to the top of the cliff then my sister is also strong enough to climb the cliff. I say to my sister:

way t'-ks-k^wn-nun-(n)t-m
 AFF EMPH-IRR-climb-MANAGE.TO-DIR-MID

‘You are going to make it’

Finally, example (65) also provides a circumstantial example, where given the state of my nose, I have no choice but to sneeze.

(65) Context: I have to sneeze (given the state of my nose) (Kratzer 1977).

kn ks-ʕat'isx-ax
1.SG.ABS IRR-sneeze-CON
'I am going to sneeze'

Example (66) shows how the irrealis marker is also felicitous in ability contexts.

(66) Context: I am physically strong enough to lift the big rock.

way ks-snwislx-st-n iʔ ʕut
AFF IRR-lift-INTR-? DET rock
'Yes, I am going to lift the rock'

2.3.3 Further ways to express non-epistemic modality

There is limited data for the bare predicate and imperative markers. The bare predicate is felicitous in a deontic context as seen in example (67a) where the little girl is telling her friends that she is not permitted to go play because she must finish her three chores. Example (67b) provides an example where the little girl has finished her chores and is permitted to go outside.

(67) Context: The little girl's friends come by and ask her to go out and play with them. She informs them that her mother says she can't go outside because she has to/must finish her chores (TFS Working Group 2011).

- a. *cut lut, xʔ ti s-ck^wult*
say NEG, finish PART NOM-work
'She said, "No, I am finishing work"'
- b. *way kn-ac-ʔickn ʔapanaʔ*
AFF 1.SG.ABS-CUST-play now
'Yes, I will play now'

The bare predicate can also be used in ability contexts as seen in (68).

(68) Context: I am physically strong enough to lift the big rock.

tali kn-k^wəck^wáct n-wis-lx-st-n iʔ xʌut
 VERY 1.SG.ABS-STRONG LIFT-INTR DER-LIFT-LEX-TRANS ROCK

‘I am very strong, I lift the rock’

Example (69) provides another ability context where Mary’s broken leg has healed and she is physically able to walk on it again. The bare predicate can be used in this case as well.

- (69) Context: When Mary’s leg heels the doctor says that she has the strength to walk on it without getting hurt.

way xəst-wílx way x^wist
 AFF GOOD-DEV AFF WALK

‘She is better now, she can walk on it’

Example (70) provides an example where the mother is speaking directly to the daughter. This is a deontic possibility context, where Mary has finished her chores and is given permission to go outside. In this case the imperative or the irrealis can be used.

- (70) Context: Mary has finished all of her chores so her mom says, “you can go outside and play”

cun-nt-əm iʔ t tuŋs ”way xuy-x ʔickn-x”
 say-CTR-MID DET OBL woman’s.mother ”AFF, GO-IMP play-IMP”

‘Her mother said “yes, go play” (TFS Working Group 2011)

Nsyilxcen appears to have only one specialized modal *cak^w* that expresses bouletic modality. There are no specialized deontic, circumstantial, teleological, or ability modals. As the data shows, Nsyilxcen speakers paraphrase to fill the absence of these non-epistemic modals. The irrealis particle *ks-* is also frequently used to express many different types of non-epistemic modality; deontic, teleological, circumstantial, and ability modality. The imperative particles are used when the speaker is directly giving an order to the addressee. Finally, the bare predicate is used to express deontic and ability modality.

2.3.4 Epistemic modals in non-epistemic contexts

The following data shows that *mat* and *cmay* are strictly epistemic and are never volunteered in non-epistemic contexts. (71b) and (71c) show that *mat* and *cmay* are rejected in a bouletic context where *cak^w* is found. In this context, the speaker is expressing that based on their desires to survive the winter, John should go hunting.

(71) Context (Bouletic): We are running low on meat supplies and need to get more so we can make it through the winter. You say John should go hunting.

- a. *cak^w ac-píx-əm*
DEON CUST-hunt-MIDDLE
'He should go hunting'
- b. # *mat ac-píx-əm*
EPIS.MOD CUST-hunt-GEN
'He must have gone hunting'
- c. # *cmay ac-píx-əm*
EPIS.MOD CUST-HUNT-MIDDLE
'He might have gone hunting'

(72) presents an ability context where the speaker talking about how lifting the large rock is within the restrictions of the subject's physical ability. In (72a) the bare predicate is used to paraphrase. (72b) and (72c) show that *mat* and *cmay* are not permitted in ability contexts such as this.

(72) Context (Ability): He is physically strong enough to lift a large rock.

- a. *taliʔ k^wəck^wáct n-wis-lx-st iʔ xλut*
VERY STRONG DER-lift-LEX-TRANS DET ROCK
'He is very strong. He lifts this rock'
- b. # *mat n-wis-lx-st iʔ xλut*
EPIS.MOD DER-lift-LEX-TRANS DET rock
'He must have lifted this rock'
- c. # *cmay n-wis-lx-st iʔ xλut*
EPIS.MOD DER-lift-LEX-TRANS DET rock
'He might have lifted this rock'

In Kratzer’s hydrangeas context, the modal propositions with *mat* and *cmay* are not felicitous as seen in (73b-c).

(73) Context (Circumstantial): My mother is buying plants in Vancouver to grow in Penticton. Penticton has a very dry climate, which is very different from Vancouver which has a very wet climate. My mom asked if these plants will grow in Penticton, given the temperature, weather, and soil in Penticton. The sales person says:

- a. *way*, *ks-pl-mixax* *iʔ* *snpinktn*
 AFF, IRR-grow-INCEP DET Penticton
 ‘Yes, the flowers will grow in Penticton’
- b. # *mat* *plal* *kl* *snpinktn*
 EPIS.MOD grow LOC Penticton
 ‘The flowers might grow in Penticton’
- c. # *cmay* *plal* *kl* *snpinktn*
 EPIS.MOD grow LOC Penticton
 ‘The flowers might grow in Penticton’

mat and *cmay* are infelicitous because, in this context, the sales person is speaking about whether the flowers have the potential to grow in Penticton given the soil and the climate. The Nsyilxcen consultants translate the sentences with *mat* and *cmay* as if the speaker is guessing about whether, in our world, the flowers would actually grow in Penticton.

2.4 Chapter summary

This chapter has provided Nsyilxcen data for epistemic and non-epistemic modality. It showed that *mat* and *cmay* are only permitted in epistemic contexts and are infelicitous in non-epistemic contexts. *mat* and *cmay* express that indirect inferential evidence was used to make the modal statement and neither modal can be used to express something that is being directly perceived. Where *mat* and *cmay* differ is with respect to their modal strength. *mat* is a variable modal that is felicitous in contexts that are compatible with both necessity and possibility readings. *cmay* on the other hand is restricted to contexts that are compatible with a possibility reading only. The third epistemic modal *k^wuk^w* is used to express that the source of

evidence is from a report. For non-epistemic modality, there is a specialized modal *cak^w* that expresses bouletic modality and the Nsyilxcen speakers make use of different particles in contexts which support other types of non-epistemic modality.

The following chapters focus on developing a semantic analysis for the epistemic modals *mat* and *cmay*. Chapter 3 discusses the semantic theory underlying this research. Chapter 4 discusses different approaches to similar modal systems. Finally, Chapter 5 discusses three potential analyses for these modals.

Chapter 3

Theoretical Background

Modality is the expression of necessity and possibility with respect to certain bodies of knowledge (epistemic), or certain facts (non-epistemic). This chapter discusses how the information expressed by a modalized sentence is semantically encoded. Under a standard theory of modality as developed by Kratzer (1977, 1981, 1991) the evaluation of a modal expression consists of three integral components; possible worlds, modal force, and conversational background. How these components are encoded across languages provides a basis for how modal systems can be compared. Section 3.1 will discuss how the modal force and conversational background interact to result in different modal readings. Section 3.2 discusses the evidential restrictions and epistemic modality and section 3.3 will provide a summary of cross-linguistic differences that have emerged from this modal framework.

3.1 Kratzerian theory of modality

A modalized sentence evaluates the basic proposition (*prejacent*) relative to a set of possibilities (von Stechow 2006). These possibilities are alternatives to the actual world and allow speakers to discuss situations that are not rooted in the here and now. This is represented in modal theory as a set of possible worlds W ; a potentially infinite set of alternate worlds that can be very similar to or vastly different from the actual world. Different modal readings emerge as a result of how the conversational background and modal force interact to select a specific subset of the set of possible worlds W .

The strength of the modal claim is represented by the modal force. Like quantifiers taking universal or existential quantification over sets of individuals, modals quantify over possible worlds. Modal necessity is formalized as universal (\forall) quantification over worlds, and modal possibility is formalized as existential (\exists) quantification over worlds. Finally, modality expresses necessity and possibility with respect to certain knowledge or facts. As previously stated there is a basic distinction drawn between epistemic modality expressing the speaker's knowledge and beliefs, and non-epistemic modality covering a number of readings including deontic, pure circumstantial, and ability.

The different types of modality are provided by the conversational background. English modals are not specified with respect to the type of modality and therefore the conversational background is supplied by the context. For instance, (74) shows that the modal *must* can be used for both epistemic and deontic modality. Other languages, including some Salish languages, may specify the type of conversational background for each modal (Matthewson et al. 2007, Rullmann et al. 2008).

(74)

<i>John must be at home (In view of what I know)</i>	(Epistemic)
<i>John must be at home (In view of what the rules require)</i>	(Deontic)

To formally distinguish between different modal readings there are two conversational backgrounds, the modal base and the ordering source (Kratzer 1977, 1981, 1991). The modal base is expressed as a function f that takes a world as an argument and returns a set of propositions. With an epistemic modal base the set of propositions, $f(w)$, represents what the speaker knows in w . A deontic modal base will consist of a set of propositions $f(w)$ representing the relevant laws, moral obligations or social conventions in w (Kratzer 1977, 1981, 1991).

The intersection of the set of propositions, $\bigcap f(w)$, yields the set of worlds in which the propositions in $f(w)$ are all true. These worlds are considered to be accessible from w . A world v is epistemically accessible from w if everything the speaker knows in w is also true in v , or it is deontically accessible if all of the rules that are present in w are obeyed in v . In the epistemic example *John must be home*, the modal base will consist of propositions that express what the speaker knows about John. For instance, this can include propositions expressing the evidence available to the speaker, the speaker's knowledge or previous experiences.

$f(w) = \{\text{The lights are on at John's house, John's car is in the driveway, John goes home after work, ...}\}$

Given these propositions, the set of worlds that are accessible from the actual world are those where these propositions in the modal base are all true.

Next, the ordering source g is also a function that takes a world w as an argument and yields a set of propositions. This set of propositions $g(w)$ places a partial ordering on the set of worlds in $\bigcap f(w)$. For an epistemic modal base there can be a stereotypical or doxastic ordering source. A stereotypical ordering source will consist of propositions that express the normal course of events in w and a doxastic ordering source will consist of propositions that express the speaker's beliefs.

$g(w) : \{\text{Lights on mean that someone is home, John drives everywhere, etc}\}$

The worlds in $\bigcap f(w)$ where the propositions in the ordering source $g(w)$ are all true will be ranked above all other worlds. The ordering source is formally defined in von Fintel & Heim (2011: 61) as follows:

(75) Given a set of worlds X and a set of propositions P , define the strict partial order $<_P$ as follows:

$$\forall w_1, w_2 \in X: w_1 <_P w_2 \text{ iff } \{p \in P : p(w_2) = 1\} \subset \{p \in P : p(w_1) = 1\}$$

For all worlds w_1 and w_2 that are members of the set of modal base worlds X . w_1 is ranked above w_2 if and only if the set of propositions from the ordering source propositions P that are true in w_2 is a proper subset of the set of propositions that are true in w_1 (von Fintel & Heim 2011). The best worlds are then selected from the ordered worlds. This is formalized using a *max* operator as in (76) (von Fintel & Heim 2011:61).

(76) For a given partial order $<_P$ on worlds, define the selection function max_P that selects the set of $<_P$ best worlds from any set X of worlds:

$$\forall X \subseteq W: max_P(X) = \{w \in X: \neg \exists w' \in X: w' <_P w\}$$

For all sets of worlds X that are a subset of worlds W , the operator max_P selects a world w that is a member of X such that it is not the case that there is some world w' that is a member of X where w' is ranked above w .

In the given example *John must be at home* the speaker uses the necessity modal *must*, which universally quantifies over the best worlds selected by the modal base and ordering source. In all the best worlds compatible with the speaker's knowledge and beliefs, John is home. The English modal *must* is defined in (77) given a contextually given modal base f , and ordering source g .

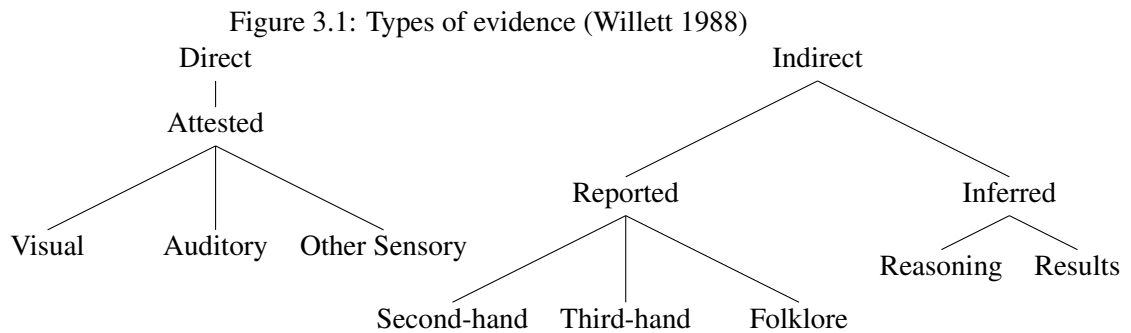
(77) $\llbracket \text{must} \rrbracket^{w,g} = \lambda f_{\langle s, st \rangle} . \lambda g_{\langle s, st \rangle} . \lambda q_{\langle s, t \rangle} . \forall w' \in max_{g(w)} (\bigcap f(w)): q(w') = 1.$

(von Fintel & Heim 2011: 61)

A modal claim using *must* states that in the best worlds among the set of worlds where John's car is in the driveway, the proposition *John must be at home* is true. All accessible worlds w' that are selected by the modal base and max_P operator are worlds where the proposition q is true.

3.2 Modality and evidentiality

In addition to the quantification over worlds and contextually given conversational backgrounds, it has also been claimed that epistemic modals can specify the evidence source (Izvorski 1997, von Stechow & Gillies 2010, Kratzer 2010, and Matthewson 2011). Willett's (1988) cross-linguistic survey of evidentiality discusses what types of evidence source are encoded across a number of languages. Based on his survey, figure 3.1 displays the types of evidentiality that languages encode.



Empirical evidence from Willett's survey shows that languages make a basic distinction between direct and indirect evidence. According to Willett's definitions, direct evidence refers to claims about situations that are directly perceived by the speaker and indirect evidence refers to claims about situations that are *not* directly perceived by the speaker. Indirect evidence covers both reportative and inferential evidentials.⁷ Inferential evidence is further split into two separate sources of evidence, inference based on results and inference based on reasoning. Willett defines these two concepts as follows (Willett 1988):

(78)

- a. *Inference from results* : The speaker infers the situation described from the **observable evidence** (i.e. from perception of the results of the causing event or action)
- b. *Inference from reasoning* : The speaker infers the situation described on the basis of intuition, logic, a dream, previous experience, or some other **mental construct**

⁷Willett refers to inferential evidentials as inferred evidentials in figure 3.1

Many Pacific Northwest languages lexically specify the type of evidence that the modal statement is based on. Epistemic modals in languages like St'át'imcets and Gitksan specifically encode the source of indirect evidence for each modal (Matthewson et al. 2007, Rullmann et al. 2008, Peterson 2010). von Fintel and Gillies (2010) similarly argue that the English epistemic modal *must* encodes indirect evidential semantics. Epistemic modals cannot be used if there is direct evidence available to the speaker, as shown in (79) where the modal *must* is infelicitous if the speaker sees that it is raining.⁸

- (79) [Seeing pouring rain]
- a It's raining
 - b ?? It must be raining

von Fintel and Gillies show that, although languages like English do not differentiate modals based on evidence source, they take into consideration the evidence source provided by the context. This provides support for the statement that many if not all epistemic modals also have an evidential restriction (Matthewson 2011).

3.3 Cross-linguistic variation

Given the theory of modality discussed in the previous section, modal systems can differ based on three separate dimensions: conversational background, evidential restriction, and modal force. This section provides data from English and two Pacific Northwest languages, St'át'imcets and Gitksan, and focuses on how the three dimensions interact to create differences between the epistemic modals of the

⁸The argument that the English modal *must* indicates evidence source emerges from a well known argument that given standard modal logic where modals quantify over possible worlds, a modalized sentence like *must* ϕ makes a stronger statement than the basic proposition ϕ (Kratzer 1991, von Fintel and Gillies 2010). Consider example (i), where the non-modalized statement in (ia) would be considered weaker than the modalized statement in (ib) given standard modal logic.

[i] (Kratzer 1991: 645)

- a She climbed Mount Toby.
- b She must have climbed Mount Toby.

However, this is not the case. von Fintel and Gillies's analysis claims that *must* ϕ does not entail ϕ (Kratzer 1991, von Fintel and Gillies 2010), rather, *must* remains a strong necessity modal but crucially signals an evidential restriction that states the speaker is basing their modal statement on indirect evidence. The apparent weak reading for *must* that Kratzer describes (1991) actually emerges from an evidential restriction rather than a force difference.

three different modal systems. The question to be answered in later chapters is how Nsyilxcen encodes the modal base, conversational background, and evidential restriction and where the Nsyilxcen modal system fits relative to other languages in the cross-linguistic modal typology. Details about the formal semantic analysis for these languages are presented and discussed in chapter 4.

To begin, there is a basic distinction between an epistemic and non-epistemic conversational background. As shown in (80) English *must* and *may* are found in both epistemic and non-epistemic contexts. The distinction between the two conversational backgrounds is provided by the context.

(80)

<i>John must be at home (In view of what I know)</i>	(Epistemic)
<i>John may be at home (In view of what I know)</i>	(Epistemic)
<i>John must be at home (In view of what the rules require)</i>	(Deontic)
<i>John may be at home (In view of what the rules require)</i>	(Deontic)

This is opposed to St'át'imcets, a Northern Interior Salish language, and Gitksan, a Tsimshianic language, which lexically encode the difference between an epistemic and non-epistemic conversational background. The epistemic modal *k'a* in St'át'imcets is permitted in epistemic contexts as in (81), and is infelicitous in non-epistemic contexts.

(81)	<i>wá7=k'a s-t'al</i>	<i>l=ti=tsitcw-s=a</i>	<i>s=Philomena</i>
	BE=EPIS	STAT-STOP	IN=DET=HOUSE-3.SG.POSS=EXIS
			NOM=PHILOMENA
	'Philomena must/ might be in her house' (Matthewson 2010)		

The non-epistemic modal *ka* is permitted in non-epistemic contexts as in (82), and is infelicitous in epistemic contexts (Matthewson et al. 2007, Rullmann et al. 2008, Davis et al. 2009).

(82)	<i>lán=lhkacw-ka</i>	<i>áts'x-en</i>	<i>ti=kwtámsts-sw=a</i>
	ALREADY=2.SG.SUBJ-DEON	SEE-DIR	DET=HUSBAND-2.SG.POSS=EXIS
	'You must/ can/ may see your husband tomorrow' (Rullmann et al. 2008: 238)		

Table 3.1 summarizes the lexical encoding of conversational background in St'át'imcets and Gitksan, as discussed by Matthewson et al. (2007), Rullmann et al. (2008), Davis et al. (2009), Peterson (2010), and Matthewson (in press [1]).

Table 3.1: Cross-linguistic variation: conversational background

	Epistemic	Non-epistemic
St'át'imcets	ku7, k'a, -an'	ka
Gitksan	=ima, =kat	da'ak(hl)xw, anook, sgi
English	must, might	

Focusing on the epistemic modal systems of St'át'imcets, Gitksan, and English shows that modals across languages can also differ with respect to evidence source. St'át'imcets lexically encodes a difference between inference made from reports, and any previous knowledge the speaker has that is relevant to the situation. Matthewson et al. (2007) analysed three St'át'imcets epistemic modals that lexically encode the source of evidence. The first is *ku7*, an epistemic reportative shown in (83).

- (83) *wa7 ku7 ku sts'éts'qwaz' l-ta stswáw'cw-a*
 BE REPORT DET TROUT IN-DET CREEK-DET

'[I heard] There are trout in the creek' (Rullmann et al. 2008: 346)

The second is *k'a*, an indirect inferring evidential with no specific source. The speaker is basing their utterance on indirect inference based on both reasoning (84) as well as observed evidence (85) (Rullmann et al. 2008).

- (84) Context: You have a headache that won't go away, so you go to the doctor. All the tests show negative. There is nothing wrong so it must just be tension.

nilh k'a lh(el)-(t)-en-s-wá(7)-(a) ptinus-em-sút
 FOC INFER FROM-DET-1.SG.POSS-NOM-IMPF-DET THINK-MID-OOC

'It **must** be from my worrying' (Rullmann et al. 2008: 321)

- (85) Context: His car isn't there

plan k'a qwatsáts
 ALREADY INFER LEAVE

'**Maybe** he's already gone' (Rullmann et al 2008: 321)

Finally, *-an'* is an epistemic modal that is permitted in a subset of contexts where *k'a* is permitted. It is restricted to contexts where the speaker is making an inference based on the results of an action or event. In (86) the speaker is making an inference based on their knowledge about John. In this context *-an'* in (86b) is semantically odd as there is no perceived evidence available to the speaker.

(86) Context: You had five pieces of *ts'wan* (wind-dried salmon) left when you checked yesterday. Today, you go to get some *ts'wan* to make soup and you notice they are all gone. You are not sure who took them, but you know that John is the person in your household who really loves *ts'wan* and usually eats lots whenever he gets the chance.

- a. *ts'aqw-an'ás k'a i ts'wán-a*
 EAT-DIR-3.ERG INFER DET.PL WIND-DRIED.SALMON-DET
 'John must have eaten the *ts'wan*' (Rullmann et al. 2008: 347)
- b. ?? *ts'aqw-an'-ás-an' i ts'wán-a kw s-John*
 EAT-DIR-3.ERG-PERC.EVID DET.PL WIND-DR.SALMON-DET DET NOM-JOHN
 'John apparently ate the *ts'wan*' (Rullmann et al. 2008: 347)

However, when the context has observable evidence both *k'a* and *an'* are permitted as seen in examples (87a) and (87b).

(87) Context: Same as in (86), except that it's not just that you think he's the one who likes *ts'wan*. This time, you see the *ts'wan* skins in his room.

- a. *ts'aqw-an'ás k'a i ts'wán-a*
 EAT-DIR-3.ERG INFER DET.PL WIND-DRIED.SALMON-DET
 'John must have eaten the *ts'wan*' (Rullmann et al. 2008: 347)
- b. *ts'aqw-an'-ás-an' i ts'wán-a kw s-John*
 EAT-DIR-3.ERG-PERC.EVID DET.PL WIND-DR.SALMON-DET DET NOM-JOHN
 'John apparently ate the *ts'wan*' (Rullmann et al. 2008: 347)

Gitksan, a Tsimshianic language, also lexically encodes the source of evidence for the modal evidentials =*ima*, an indirect inferring evidential as shown in (88), and =*kat*, a reportative as shown in (89).⁹

⁹Peterson also presents a non-modal evidential *ńakw*, expressing inference based on physical evidence. Peterson gives the evidential *ńakw* a non-modal analysis due to its syntactic and semantic differences compared to the modal evidential =*ima*. (Peterson 2010)

- (88) Context: You're wondering what your friend is doing. You notice his rod and tackle box are not in their usual place.

yugwimahl dim iixwt
 yukw=**ima**=hl tim iixw-t
 PROG=MOD=CND FUT FISH-3

'He might/must be going fishing'

'He's probably going fishing'

'He's likely going fishing'

'He could be going fishing'

'Maybe/perhaps he's going fishing' (Peterson 2010: 27)

- (89) si-hon=**kat**=t John
 CAUS-FISH=KAT=PND JOHN

'[I heard] John is doing up fish' (Peterson 2010: 12)

These modal systems differ from the English system which does not usually encode different types of evidence source. In contrast to St'át'imcets, when *must* or *might* are used epistemically, they allow for different kinds of indirect evidence with or without a specific source.¹⁰ This shows that English, St'át'imcets and Gitksan differ with respect to how the conversational backgrounds are encoded in the language. Table 3.2 shows that the St'át'imcets and Gitksan epistemic modals are lexically encoded for the type of modal base whereas the modal base for English epistemic *must* and *might* are contextually determined and do not explicitly distinguish different sources of evidence.

Table 3.2: Cross-linguistic variation: evidence source

	Reportative	Indirect inferring evidential	Inferring evidential from results
St'át'imcets	ku7	k'a	-an'
Gitksan	= <u>kat</u>	= ima	
English	must, might		

¹⁰This is a simplified description of the English modal system, which is intended to show the basic distinction between different modal systems.

Languages also show variation with regards to modal force. In English, *must* is always a necessity modal taking universal quantification over possible worlds and *might* is a possibility modal taking existential quantification over possible worlds. This differs from the St’át’imcets and Gitksan modals which are permitted in contexts that permit necessity and possibility interpretations (Matthewson et al. 2007, Rullmann et al. 2008, Davis et al. 2009, Peterson 2010). This difference is shown in table 3.3 where epistemic modals in St’át’imcets and Gitksan are permitted in contexts that permit necessity and possibility interpretations.¹¹

Table 3.3: Cross-linguistic variation: modal force

	Universal Force (Necessity)	Existential Force (Possibility)
St’at’imcets	ku7, k’a, -an’	
Gitksan	=kat,=ima	
English	must	might

Comparative evidence from St’át’imcets, Gitksan, and English shows that cross-linguistic differences between modal systems are due to how the modal space is organized based on how the modal force and conversational background are encoded (Rullmann et al. 2008). The English modal system shows variable conversational background and lexically encodes modal force. The St’át’imcets and Gitksan modal systems lexically encode conversational background and have variable modal force interpretations. There is a third system examined by Vander Klok (2008); the Javanese modal system lexically encodes both modal force and conversational background. There is a specialized universal deontic modal *kudu*, two existential deontic modals *ento* and *oléh*, a universal epistemic modal *mesthi*, and an existential epistemic modal *mungkin*.

Table 3.4: Javanese modality

	Necessity	Possibility
Deontic	kudu	ento, oléh
Epistemic	mesthi	mungkin

Maria Amélia Reis Silva’s (2010) examination of the Blackfoot modal system shows that Blackfoot modals are lexically encoded for both modal force and conversational background. Blackfoot makes a lexical distinction between necessity

¹¹ Although St’át’imcets and Gitksan modals can be used in both necessity and possibility contexts and crucially do not encode differences in force, the analyses by Matthewson et al. (2007), Rullmann et al. (2008), and Peterson (2010) lexically encode the modal force and have mechanisms in place to allow for the variable readings.

and possibility like Javanese, however there is also a distinction between weak and strong necessity. Reis Silva examines six modals. There is an epistemic strong necessity modal *ááhk*, an epistemic possibility modal *ááhkamá’p*, as well as a third epistemic weak necessity modal *ááhkam*. This three way distinction in force is also present in the circumstantial modals. There is a circumstantial strong necessity modal *sstsina’*, a circumstantial possibility modal *ohkott*, as well as a circumstantial weak necessity modal *áákohk*.

Table 3.5: Blackfoot modality

	Strong Necessity	Weak Necessity	Possibility
Circumstantial	sstsina’	áákohk	ohkott
Epistemic	ááhk	ááhkam	ááhkamá’p

Lastly, Amy Rose Deal (2011) analyzes the Nez Perce circumstantial modal *o’qa*. Similar to St’át’imcets and Gitksan modals, *o’qa* is restricted to a single modal base and is felicitous in contexts compatible with necessity or possibility readings. Deal argues for an encoded possibility modal force and analyses *o’qa*’s variable strength in terms of what she calls quantifiers without a scale. Deal’s analysis will be discussed in detail in section 4.1.3.

To summarize the cross-linguistic variation just discussed, research has yielded a preliminary modal typology as shown in table 3.6.

Table 3.6: Cross-linguistic modal typology 1

	Variable Conversational Background	Encoded Conversational Background
Variable Force		St’át’imcets, Gitksan, Nez Perce- <i>o’qa</i>
Encoded Force	English	Javanese

Based on the empirical data presented in chapter 2, I argue that *mat* lexically encodes an epistemic conversational background and has variable modal force like the epistemic modals in St’át’imcets and Gitksan. However, *cmay* also lexically encodes an epistemic conversational background but is restricted to existential modal force contexts, similar to the possibility epistemic modal *ento* in Javanese. This presents an interesting puzzle for the theoretical typology presented in table 3.6. Within the typology presented below, Nsyilxcen cross-cuts multiple systems within the same language and within the same (epistemic) domain.

Table 3.7: Cross-linguistic modal typology 2

	Variable Conversational Background	Encoded Conversational Background
Variable Force		St't'imcets, Gitksan, Nez Perce- <i>o'qa</i> , Nsyilxcen- mat
Encoded Force	English	Javanese, Nsyilxcen- cmay

Section 4.1 will summarize in more detail the formal modal analyses presented by previous work on St'át'imcets, Gitksan, and Nez Perce, and will discuss how they contribute to an analysis for the partially variable system seen in Nsyilxcen. Finally, Chapter 5 will discuss three potential formal analyses for the Nsyilxcen epistemic modals.

Chapter 4

Epistemic Modals: Comparative Semantic Analyses

As discussed in section 3.3 epistemic modal systems across languages differ with respect to how they encode conversational background, evidential restrictions, and modal force. Based on the data presented in 3.3 and the Nsyilxcen data presented in chapter 2, table 5.5, shows where Nsyilxcen fits into the preliminary modal typology.

Table 4.1: Cross-linguistic modal typology 3

	Variable Conversational Background	Encoded Conversational Background
Variable Force		St'át'imcets, Gitksan, Nez Perce- <i>o'qa</i> , Nsyilxcen- mat
Encoded Force	English	Javanese, Nsyilxcen- cmay

This chapter will discuss how previous semantic analyses for languages like St'át'imcets, Gitksan, and Nez Perce, account for modal force variability. These analyses as well as the modal theory discussed in chapter 3 provide a basis for which the Nsyilxcen modals can be analysed.

4.1 Comparative models

This section will discuss semantic analyses for St'át'imcets (Matthewson et al. 2007, Rullmann et al. 2008), Gitksan (Peterson 2010), and Nez Perce (Deal 2011) to better understand modals that are compatible with necessity and possibility interpretations. This is to determine what type of an analysis will best account for the Nsyilxcen data. There are three possible analyses that can account for this data, each of which make different empirical predictions.

As discussed in section 2, the Nsyilxcen epistemic modals lexically encode the modal base and specify the type of evidence used to make the modal statement. *mat* is compatible with both necessity and possibility translations and *cmay* is compatible with a possibility interpretation only. Working under the assumption that *mat* and *cmay* are modals operating at a propositional level, an analysis similar to the S'át'incets (Matthewson et al 2007, Rullmann et al 2008) or Gitksan (Peterson 2010) evidential modals can be used to account for the flexibility of *mat*. However, like English and Javanese modals, the analysis of *cmay* will need to account for its restricted possibility interpretation. Section 4.1.3 introduces a view of flexible modal force interpretations from Deal's (2011) analysis for Nez Perce which looks at modals as quantifiers without a scalar implicature. It will discuss how Deal approaches a modal with flexible force interpretations and how this approach may not apply to Nsyilxcen.

4.1.1 St'át'incets modal analysis: Rullmann et al. 2008

Matthewson et al. (2007) and Rullmann et al. (2008) analysed three St'át'incets evidential modals, *ku7*, *k'a* and *-an'*. These modals lexically encode an epistemic conversational background and are flexible between necessity and possibility interpretations. This section will focus on presenting the indirect inferring evidential *k'a* in St'át'incets and the analysis accounting for a default universal modal force with weakening.

The following contexts show that *k'a* encodes that the speaker is making an epistemic claim based on indirect inference (Matthewson et al. 2007, Rullmann et al. 2008). These examples also show the variability of modal force translations for *k'a*.

- (90) Context: You have a headache that won't go away, so you go to the doctor. All the tests show negative. There is nothing wrong so it must just be tension (Rullmann et al 2008: 321)

nilh k'a lh(el)-(t)-en-s-wá(7)-(a) ptinus-em-sút
 FOC INFER FROM-DET-1.SG.POSS-NOM-IMPF-DET THINK-MID-OOC

'It **must** be from my worrying'

- (91) Context: His car isn't there (Rullmann et al 2008: 321)

plan k'a qwatsáts
 ALREADY INFER LEAVE

'**Maybe** he's already gone'

The Rullmann et al. (2008) analysis proposes a fixed universal quantification over possible worlds for the St'át'imcets modals. Although the modals are shown to allow for both necessity and possibility interpretations there is a preference for a universal interpretation.

To account for the evidential restriction, lexically encoded conversational background, and universal modal force with weakening, Rullmann et al. (2008) adopt an analysis based on Klinedinst's (2006, 2007) for English possibility modals, in combination with Reinhart's choice function analysis for specific plural indefinites. The choice function f in a modal analysis will pick out a non-empty subset of possible worlds that are accessible from the actual world.

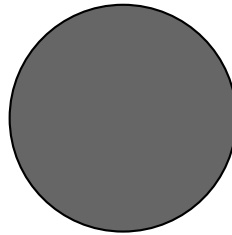
(92) Modal Choice Function (Rullmann et al. 2008: 337)

A function f of type $\langle_{st,st} \rangle$ is a modal choice function iff for any set of worlds W , $f(W) \subseteq W$ and $f(W) \neq \emptyset$

The evaluation of the St'át'imcets evidential modals like $k'a$ requires two parameters. $B(w)$ is equivalent to $\bigcap f(w)$ discussed in chapter 3. The intersection of the set of propositions, $\bigcap f(w)$, yields the set of worlds in which the propositions in $f(w)$ are all true. These worlds are considered to be accessible from w . A world v is epistemically accessible from w if everything the speaker knows in w is also true in v . The second parameter is the choice function f which picks out a non-empty subset of the worlds selected by the modal base, $B(w)$. The modal then universally quantifies over the worlds in $f(B(w))$ (Rullmann et al 2008: 327).

Variability in modal strength emerges from the size of the domain of quantification. This is similar to domain restrictions for quantification over individuals. Universal quantification over a set of individuals can be weakened if the domain of quantification is restricted. For instance, 'everyone in the world likes hockey'. The universal quantifier selects the entire set of individuals. In this case it selects the very large set of individuals in the world.

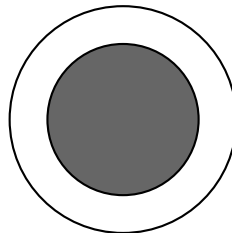
Figure 4.1: Strong universal quantification



'Everyone in the world likes hockey'

Individuals in this room is a much smaller set of individuals. In this case, the universal quantifier selects a subset of the larger set of individuals in the world. Therefore, 'Everyone in this room likes hockey' is weaker than 'Everyone in the world likes hockey'.

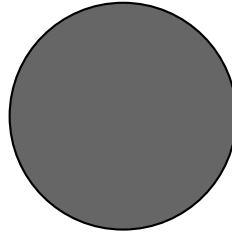
Figure 4.2: Weak universal quantification



'Everyone in this room likes hockey'

The opposite occurs with existential quantification over individuals; the larger the domain of quantification the weaker the reading. Existential quantifiers select an individual from a set of individuals. In this case, the quantifier selects an individual from the very large set of individuals in the world. This yield a weak reading.

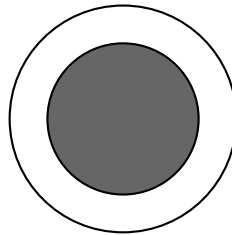
Figure 4.3: Weak existential quantification



'Someone in the world likes hockey'

For a smaller subset of individuals in the world, like the people in this room, the existential quantifier selects an individual from that set. Existential quantification over a smaller set of individuals, like people in this room, will yield a stronger reading. As a result, 'Someone in this room likes hockey' is stronger than 'Someone in the world likes hockey'.

Figure 4.4: Strong existential quantification



'Someone in this room likes hockey'

The same weakening and strengthening effects of domain restriction arise when the quantification is over worlds rather than individuals. With an encoded universal modal force the flexibility between necessity and possibility force interpretations in St'át'incets results from the set of worlds selected by the choice function f . If the choice function is the identity function it picks out the entire set of worlds selected by the modal base. This results in universal quantification over the biggest possible subset of worlds yielding a necessity reading. On the other hand, if f selects a proper subset of worlds in $B(w)$, universal quantification over a smaller set of worlds will result in a weaker possibility reading. In both cases the modal

will universally quantify over the set of worlds selected by the modal base and choice function. In addition to the modal base and choice function, there is also a presupposition specifying that the speaker was basing the modal statement on inferential evidence. The following is the formal semantic denotation for the *k'a* modal from Rullmann et al. (2008: 350).

(93) *Semantics of k'a (inferential)*

$\llbracket k'a \rrbracket^{c,w}$ is only defined if *c* provides an epistemic modal base *B* such that for all worlds $w', w' \in B(w)$ iff the inferential evidence in *w* holds in w' .

$$\llbracket k'a \rrbracket^{c,w} = \lambda f_{\langle st, st \rangle}. \lambda p_{\langle s, t \rangle}. \forall w' [w' \in f(B(w)) \rightarrow p(w')]$$

Rullmann et al. (2008) mention in a footnote that using an ordering source provided by the standard modal framework is an alternative to a choice function analysis. Kratzer (2012), Peterson (2010), and Portner (2009) also discuss how an ordering source analysis would work for the St'át'imcets modal system. This type of analysis will be discussed further in section 4.1.2.

4.1.2 Gitksan modal analysis: Peterson 2010

The Gitksan modal *=ima* is strictly an epistemic modal and is compatible with contexts that allow for necessity or possibility interpretation. It also encodes an evidential restriction that the speaker was basing the modal statement on indirect inferential evidence. Example (94) shows the variability of modal force translations for *=ima* (Peterson 2010).

(94) Context: You're wondering what your friend is doing. You notice his rod and tackle box are not in their usual place.

yugwimahl dim iixwt
yukw=ima=hl tim iixw-t
 PROG=MOD=CND FUT FISH-3

'He might/must be going fishing'

'He's probably going fishing'

'He's likely going fishing'

'He could be going fishing'

'Maybe/perhaps he's going fishing' (Peterson 2010: 27)

In this context, Peterson argues that there is no reason to assume that it is necessarily the case that your friend is fishing or that it is a mere possibility that your friend is fishing. However, the context can force either a necessity or possibility reading. Example (95) shows a context where a necessity translation is preferred over a possibility translation (Necessity > Possibility). Example (96) presents a context where a possibility translation is preferred over a necessity translation (Possibility > Necessity).

- (95) Context: The speaker’s father was away frequently when she was a child.

<i>naa’ayima</i>	<i>’an yookxwin̓</i>
<i>naa’=ima</i>	<i>’an yookxw-in-̓</i>
MOTHER(INFORMAL)=MOD	S.REL EAT-CLAUS-1SG

”It **must** have been mother who fed/cooked for me.”

>”It **might** have been mother who fed/cooked for me.” (Peterson 2010: 162)

- (96) Context: You see your uncle stopped at the intersection talking to some people through the window of his pickup. You and your friends don’t recognize the people.

<i>wilaayimas</i>	<i>nibib̓</i>	<i>(’nidiit)</i>
<i>wilaa-i=ima=s</i>	<i>nibib-̓</i>	<i>(’nidiit)</i>
KNOW-TR-3=MOD=PND	MOTHER’S.BROTHER-1SG	(3PL)

‘My uncle **might** know them’

>‘My uncle **must** know them’ (Peterson 2010: 163)

Peterson also argues that =*ima* has a preferred possibility modal force reading. This is based on Gitksan speakers’ judgments for =*ima* when asked specifically about the strength as well as their preference for *might*-like out-of-the-blue translations (Peterson 2010: 171). Examples (97a) and (97b) also provide support for this claim as they show that Gitksan has a way of disambiguating =*ima* as an existential modal.

There is a non-modal evidential in Gitksan, *’nakw*, which is only permitted in a subset of the contexts where =*ima* is felicitous. Both are found in contexts with indirect observable evidence from the results of an action or event. In these contexts *’nakw* receives a stronger necessity reading and =*ima* is restricted to the default possibility interpretation. Both *’nakw* and =*ima* are felicitous in (97). Peterson claims that in contexts like (97) if the speaker chooses to use *’nakw* over =*ima*

the speaker is making a stronger claim from the physical evidence available to him/her. When *=ima* and *nak^w* are felicitous in the same context, because *nak^w* is unambiguously a necessity modal claim the speakers will no longer translate *=ima* as a necessity modal (Peterson 2010: 168).

(97) Context: You and a friend are at the store and you see a dollar coin on the ground. It could be yours, your friend's, or the person in front of you in line may've dropped it.

a. *k'woodindimahl* *daalat*
 k'woo-T-in-t=**ima**=hl daala-t
 DROP-T-CAUS-3.SG=MOD=CND MONEY-3.SG
 'S/he might've dropped his/her money' (Peterson 2010: 168)

b. *ñakwt* *k'woodindimahl* *daalat*
ñakw=t k'woo-T-in-t=*ima*=hl daala-t
 EVID=3.SG DROP-T-CAUS-3.SG=MOD=CND MONEY-3.SG
 'S/he **must**'ve dropped his/her money' (Peterson 2010: 168)

To summarize the generalizations made by Peterson (2010), *=ima* is a general inferential evidential modal with variable modal force readings. When *=ima* is found in contexts where the non-modal evidential *ñakw* is also permitted, it is restricted to its default possibility reading.

As discussed in section 3.3, the Gitksan epistemic modal system, like the St'át'imcets modal system, is the inverse of the English modal system. Peterson's analysis assumes a fixed existential quantificational force for *=ima* which accounts for the preferred possibility modal force reading. Variability arises as a result of the ordering source, which Peterson assumes is contextually determined. The semantic denotation for *=ima* that Peterson proposes is shown below (Peterson 2010:180).

(98) $\llbracket =ima \rrbracket^{c,w}$ is only defined if *c* provides a modal base **B** such that for all worlds $w' \in B(w)$, the inferential evidence in *w* holds in w' .

If defined $\llbracket =ima \rrbracket^{c,w} = \lambda p. \exists w' [w' \in \text{Og}(w) (B(w)) \wedge p(w') = 1]$

(Peterson 2010: 179)¹²

¹²Peterson's formal semantics introduces the functions **B** and **O**. The **B** is equivalent to $\bigcap f(w)$. Again, this is the intersection of the set of propositions that yields a set of worlds accessible from *w* in which the propositions in *f(w)* are all true. **O** is equivalent to the *max* operator that takes the partial ordering of worlds by the ordering source function *g(w)* and selects the best of those worlds.

Given that the analyses for St'át'imcets and Gitksan argue for a fixed modal force, universal for St'át'imcets and existential for Gitksan, the ordering source analysis will work in a similar way but will have the opposite result for the Gitksan modals. The following example shows how the modal base and ordering source interact to allow for the default possibility interpretation for =*ima* (Possibility >Necessity).

- (99) *yugwima=hl iixwis John*
yukw=ima=hl iixw-(t)=s John
 PROG=MOD=CND FISH-3=CND JOHN

”John **might** be fishing” >John **must** be fishing.” (Peterson 2010: 176)

B(w) Epistemic: { John’s rubber boots are missing; his truck is not in the driveway, it’s fishing season }

g(w) Empty: \emptyset

The modal base B is lexically encoded to be epistemic and is a function from worlds to a set of propositions. The intersection of these propositions yields a set of possible worlds that are compatible with the speaker’s knowledge (Peterson 2010:181). The possibility interpretation of (99) arises because the ordering source is empty. An empty ordering source will have no propositions and will yield a larger set of worlds.¹³ Existential quantification over a larger set of worlds selected by the modal base yields a possibility interpretation. In this case the speaker does not believe that rubber boots are only used for fishing. Therefore Og(w) will also include worlds where John is hunting or berry picking as well as worlds where John is fishing. This results in there being fewer worlds where it is true that, if John’s boots are missing it means that John is fishing. This yields a weak modal force interpretation where it is only a slight possibility that ‘John is fishing’ in w (Peterson 2010: 177).

The following example (100) gives Peterson’s modal base and ordering source for a necessity interpretation of =*ima* (Necessity >Possibility) (Peterson 2010).

¹³Kratzer (1991) points out that the ordering source cannot be strictly empty otherwise we would get a strong reading where *must* ϕ would always entail ϕ . In actuality, as argued by Kratzer and assumed by many others, *must* ϕ is actually weaker than ϕ . In order to weaken the modal proposition the worlds quantified over are restricted by the ordering source propositions. However, it is crucial that those propositions cannot all be true in the actual world as this would still necessarily include the actual world resulting in the incorrect strong reading. In order to get the weaker reading, we must be able to quantify over a set of worlds that potentially does not include the actual world. See von Stechow and Gillies for an alternative view on the relative strengths of *must* ϕ and ϕ (2010).

- (100) *yugwima=hl iixwis John*
yukw=ima=hl iixw-(t)=s John
 PROG=MOD=CND FISH-3=CND JOHN

”John **must** be fishing” >John **might** be fishing.” (Peterson 2010: 176)

B(w) Epistemic: { John’s rubber boots are missing, his truck is not in the driveway, it’s fishing season }

g(w) Stereotypical: { Rubber boots are used for fishing, rubber boots are not ideal for hunting, or berry picking }

The necessity interpretation for (100) arises if there is a non-empty ordering source containing propositions that place restrictions on the set of worlds to be existentially quantified over. If the ordering source is stereotypical, like in example (100), it will include propositions that express the normal course of events. For (100), it will include propositions such that rubber boots are used for fishing only and not for other activities. Worlds where John uses his boots solely for fishing will be ordered higher than worlds where John uses his rubber boots for berry picking or hunting. Furthermore, the stereotypical ordering source contains propositions that represent the normal course of events in *w* and are therefore assumed to be true. Therefore the actual world is probably one of the smaller set of worlds selected by the ordering source which implies a necessity reading; it is probably the case that John is fishing in the actual world. For (100), worlds where John uses his boots for fishing, are worlds in which John is fishing is true and the speaker believes *w* to be such a world. This yields a strong modal force interpretation, translated as *must*.

As mentioned in section 4.1.1, an ordering source analysis can also account for the St’át’imcets data. However, because the modal *k’a* is a universal quantifier the ordering source will have the opposite effect on the modal force readings from the Gitksan existential modals. Universal quantification over a smaller domain of possible worlds will result in a weaker reading. A non-empty ordering source will restrict the set of possible worlds that are universally quantified over. Crucially, the extra propositions that serve to restrict the set of possible worlds may be true or false in the actual world. To illustrate this, consider the epistemic example provided by Rullmann et al. (2008).

- (101) Context: John played bingo last night and is spending lots of money today.
t’cum k’a kw s-John
 WIN(MID) INFER DET NOM-JOHN

‘John must/may have won’ (Rullmann et al 2008: 339)

The modal base yields a set of worlds that are epistemically accessible from the evaluation world w based on the speaker's knowledge. In this case, worlds that are epistemically accessible are those where the propositions that John played bingo last night and John is spending lots of money today are true (Rullmann et al. 2008:339). Next the ordering source will determine the size of the set of worlds to be universally quantified over. An empty ordering source will yield the largest possible set of worlds which will result in the stronger modal force reading. Conversely, consider a stereotypical ordering source that contains propositions where the normal course of events would be where responsible people only spend money when they have extra funds. In this case, only those worlds that are highly ranked by the stereotypical ordering source will be universally quantified over. Given that John played bingo last night and is spending money today, *John must have won*. This results in a weaker reading for $k'a$.¹⁴ The set of accessible worlds will be restricted even further to those worlds where 1) the evidence holds and 2) the evidence indicated that John won playing bingo last night. A non-empty ordering source will result in a weaker modal force reading, as universal quantification over a more restricted set of worlds will yield a weaker reading. (102) is Peterson's lexical entry for the St'át'imcets modal $k'a$ (Peterson 2010: 184/185).

(102) $\llbracket k'a \rrbracket^{c,w}$ is only defined if c provides a modal base B such that for all worlds $w' \in B(w)$, the inferential evidence in w holds in w' . If defined,

$$\llbracket k'a \rrbracket^{c,w} = \lambda g. \lambda p. \forall w' [w' \in \text{Og}(w) (B(w)) \rightarrow p(w') = 1]$$

$B(w) = \{\text{The lottery draw was last night, John is spending money today, etc.}\}$

Doxastic: $g(w) = \{\text{Responsible people only spend money when they have extra funds, etc.}\}$

This shows that a unified ordering source analysis can also account for a system like St'át'imcets. Deal (2011) presents an alternative approach for understanding modal systems that show flexibility between necessity and possibility interpretations. Based on the Nez Perce circumstantial modal $o'qa$, Deal develops an analysis inspired by predictions for quantifiers that lack scalar implicatures.

4.1.3 Nez Perce: modals without scales

In Nez Perce the modal $o'qa$ is strictly encoded for a circumstantial modal base and has variable modal force translations. To account for $o'qa$, Deal draws a parallel between quantifiers over individuals and modals which quantify over possible

¹⁴See discussion in Peterson (2010: 185).

worlds. When two elements form a scale and a speaker uses a quantifier like English *some* or *might* it gives rise to an implicature that there is an alternative, like English *all* or *must* (Deal 2010), that was not used and therefore believed by the speaker to be false. Quantifiers that lack a scale will not create a scalar implicature and certain predictions can be made about how they should behave in upward and non-upward entailing contexts. Nez Perce consultants provide both necessity and possibility translations for *o'qa* and also volunteer *o'qa* in contexts that allow for necessity or possibility interpretations in upward entailing contexts.

- (103) Context: A friend is preparing for a camping trip. I am taking this person around my camping supplies and suggesting appropriate things. I hand them two blankets and say (Deal 2010: 4)

'inéhne-no'qa 'ee kii lepít cīckan
 TAKE-MODAL YOU DEM TWO BLANKET

- a) 'You can take these two blankets'
 b) 'You should take these two blankets'

The modal force variability persists only in upward entailing contexts. In non-upward entailing contexts *o'qa* loses its variability and is only permitted with possibility interpretations. Deal gives data for *o'qa* in non-upward entailing contexts like scoping under negation, in the restriction of universals or in the antecedent of a conditional sentence. In all of these non-upward entailing environments *o'qa* only receives a possibility translation.

In non-upward entailing contexts, an existential quantifier is stronger than a universal quantifier. For instance, the sentence 'It is not the case that some students passed' entails that it is not the case that every student passed. Since the negated existential quantifier is stronger this predicts that there will be no scalar implicature which will not result in flexible readings for *o'qa* in non-upward entailing contexts. Deal shows that these predictions hold for *o'qa*. The prediction is that *o'qa* will be rejected in possibly-not and not-necessary contexts. To begin, Deal shows that negation always scopes over the modal in NP constructions and therefore cannot generate a possibly-not reading. As a result, the only reading for *o'qa* in non-upward entailing is a not-possible reading and scopes under negation. Example (104) shows that *o'qa* is felicitous in a context that calls for not-possibly interpretation.

- (104) Context: The referee is talking to an injured player

<i>tam'áalwit-wecet</i>	<i>wéet'u</i>	<i>'ee</i>	<i>xeeleewi-yó'qa</i>	
RULE-REASON	NEG	YOU	PLAY-MODAL	
<i>'étke</i>	<i>k'omáy'c</i>	<i>'ee</i>	<i>wee-s-Ø</i>	<i>'áatim</i>
BECAUSE	HURT	YOU	BE-P-PRES	ARM

'According to the rules, you can't play, because your arm is injured' (Deal 2011:22)

Next, example 105 shows that *o'qa* is rejected in contexts that call for not-necessary translations (Deal 2011: 22). The speaker's comments for example (105) indicate that the correct interpretation for *o'qa* is not-possible. The desired reading in this example is not-necessary, but is infelicitous. Therefore *o'qa* is analyzed as a possibility modal.

(105) Context: You are explaining to someone who thinks they have to leave that they are not in fact required to do so. It's not necessary for them to leave.

#wéet'u 'ee kiy-ó'qa
NOT YOU GO-MODAL

Consultant: That's a different conversation, not this one. You're just saying ... 'you can't go' (Deal 2011: 22)

For Nez Perce, Deal analyses the circumstantial modal *o'qa* as a modal without a scale and shows that it does behave as predicted in these environments. Since *o'qa* lacks a scale it has variable modal force translations. Nez Perce consultants provide both necessity and possibility translations for *o'qa* and also volunteer *o'qa* in contexts that allow for necessity or possibility interpretations in upward entailing contexts.¹⁵

Context: A friend is preparing for a camping trip. I am taking this person around my camping supplies and suggesting appropriate things. I hand them two blankets and say (Deal 2010: 4)

(106) *'inéhne-no'qa 'ee kii lepít cíckan*
TAKE-MODAL YOU DEM TWO BLANKET

- a) 'You can take these two blankets'
- b) 'You should take these two blankets'

¹⁵Modals with different conversational backgrounds cannot form a scale with one another. Deal shows that *o'qa* is strictly circumstantial and is not permitted in epistemic contexts. As a result, even though there exists a necessity epistemic modal in Nez Perce, it cannot act as a dual of *o'qa*.

There is however, a general preference for possibility translations for *o'qa*, similar to *=ima* in Gitksan. Furthermore, the modal force variability persists only in upward entailing contexts. In non-upward entailing contexts *o'qa* loses its variability and is only permitted with possibility interpretations.

Deal compares the behaviour of *o'qa* to modal systems like English which do have scalar implicatures and modal systems like S'át'imcets and Gitksan which also have modals without scales like Nez Perce. Deal provides a typology for the cross-linguistic variability in modal systems based on this semantic framework and makes predictions for their behaviour in non-downward-entailing and downward entailing contexts. This is provided in table 4.2 ¹⁶.

Table 4.2: Three types of modal systems (Deal 2010: 34)

Inventory	\forall, \exists	\exists	\forall
	Modals with scales	Modals without scales	
Example	English	Nez Perce Gitksan	St'át'imcets
Profile	Inflexible modals SI for \exists in UE context; SI for \forall in DE contexts	Modals flexible in UE Barring other factors; modals inflexible in DE contexts	Modals flexible in DE contexts Barring other factors: modals inflexible in UE contexts.

This typology makes a basic distinction between modals with scales and modals without scales. Modals without scales can further distinguish between systems like Gitksan and Nez Perce with a preferred possibility modal reading and St'át'imcets with a preferred necessity modal force reading. This analysis yields three way typology which makes certain predictions.

The English modal system creates scalar implicatures with modals like *must* and *might*. Both modals, as predicted do not have variable modal force readings. *might* is strictly existential and *must* strictly universal. A scalar implicature can exist because both modals are of the same type, they can both be circumstantial or both be epistemic depending on the context. Scalar implicatures exist in upward entailing environments for possibility modals, for instance, 'He might like hockey' implies 'it is not the case that he must like hockey'. Also a scalar implicature exists in non-upward entailing environments for universal modals, for instance 'He doesn't have to leave' implies 'it is not the case that he can't leave'.

¹⁶SI = Scalar implicature, UE = non-downward-entailing, DE = Downward entailing

In St'át'incets, all modals prefer a necessity modal force interpretation but permit possibility interpretations. For this type of system with a fixed universal modal force, Deal predicts that the inverse of the Nez Perce system should emerge. Specifically, in upward entailing contexts the modals should be inflexible and in non-upward entailing contexts the flexibility of the S'tát'incets modals should persist. However, contrary to what is predicted modal force variability persists in upward entailing contexts for St'át'incets modals. Deal explains that the choice function analysis set forth by Rullmann et al (2008) is a specialized mechanism that is necessary to account for the existence of variability in upward entailing contexts. The only way to be certain that the predictions from a scalar implicature approach hold comes from non-upward entailing contexts. However, Rullmann et al (2008) report syntactic restrictions in St'át'incets that prevent properly testing the modals in non-upward entailing contexts. Also, if an ordering source analysis were to replace the choice function analysis this is no longer an additional mechanism used to account for the variability in an upward entailing context. Then the question arises of what would prevent *o'qa* from getting strengthened by the ordering source.

The epistemic modal *=ima* in Gitksan is most similar in behaviour to *o'qa*. Deal's scalar implicature approach could be applied to Gitksan as *=ima* is strictly epistemic, has variable modal force interpretations in upward entailing contexts, has a preference for an existential modal force, and does not have a dual. However, crucial data from non-upward entailing contexts is required to determine whether *=ima* will behave as Deal predicts. That is *=ima* is predicted to lack modal force variability and be restricted to a possibility force reading in non-upward entailing contexts. However, Matthewson (in press [2]) states that it is also difficult to collect the relevant data in Gitksan.

The Nsyilxcen epistemic modals present interesting empirical data for this approach. Because there is one variable modal and one non-variable modal, Nsyilxcen does not fit neatly into one single system. *mat* is similar to St'át'incets with variable force and *cmay* fits best in the English or Javanese systems with a strictly encoded possibility reading. This raises the question of whether Deal's analysis will hold for Nsyilxcen.

The following chapter will discuss three possible analytical approaches for the epistemic modals *mat* and *cmay*. The first will discuss encoding a universal modal force for *mat* and an existential modal force for *cmay* and the second two will discuss encoding an existential modal force for both *mat* and *cmay* with different approaches to deal with the partially variable system.

Chapter 5

Formal Semantic Analysis for the Nsyilxcen Epistemic Modals

The empirical data shows that the Nsyilxcen epistemic modals strictly encode the modal base and have an indirect inferential evidential restriction. (107) provides the semantic formalism for these generalizations.

(107) *Presupposition for Nsyilxcen modals: (Adapted from Rullmann et al. (2008) and Peterson (2010)).*

$\llbracket \text{Epistemic Modal} \rrbracket^{c,w}$ is only defined if c provides a modal base f such that for all worlds $w' \in \bigcap f(w)$, the inferential evidence in w holds in w' .

Sections 5.1, 5.2, and 5.3 present three possible options to account for the modal force variability of *mat* and the strict existential modal force for *cmay*.

5.1 Option #1

The first option is to adopt a gradable modality approach. Gradable modals represent readings that extend beyond a simple distinction between logical possibility and necessity. As the Nsyilxcen data shows, *mat* is permitted in a wide range of contexts covering both possibility and necessity interpretations and *cmay* has a strict possibility interpretation. Kratzer (1981) discusses the notion of gradable modality using German as a case study and provides the following example to illustrate.¹⁷

(108) Context: Much-Girgl has been murdered on his way home. The police start investigations. Certain conclusions may be drawn from what is known about the circumstances of the crime. Utterances of the following sentences are likely to have occurred in such a situation (Kratzer 2010: 9):

¹⁷For a more recent discussion of gradable modality see Lassiter (2010)

a. *Der Kastenjakl kann der mörder sein*

THE KASTENJAKL CAN THE MURDERER BE

‘Kastenjakl may be the murderer’

b. *Der Gauzner-Michl muß der Mörder sein*

THE GAUZNER-MICHL MUST THE MURDERER BE

‘Gauzner-Michl must be the murderer’

(108a) and (108b) are two possible answers expressing the police inspector’s certainty given the evidence available to him. Given that the inspector does not know every detail about the real world he must draw conclusions from the available evidence. The evidence available to the inspector is compatible with a set of worlds selected by an epistemic modal base. The stereotypical ordering source then ranks these epistemically accessible worlds relative to what the normal course of events would be. Given an epistemic modal base and stereotypical conversational background it is possibly the case that Kastenjakl is the murderer or necessarily the case that Gauzner-Michl is the murderer in the world *w* given the modal base *f* and the ordering source *g* provided by the context. However, in languages like German and English, there are many more grades of modality that create a scale with possibility on one end and necessity on the other. In the murder example, as new evidence becomes available during the investigations the inspector can reach different conclusions of gradable strength based on what he knows. Examples (109)–(112) show that German has many different ways of expressing grades of modal strength other than necessity and possibility.

(109) *Es kann gut sein, daß der Gauzner-Michl der Mörder war*

IT CAN WELL BE THAT THE GAUZNER-MICHL THE MURDERER WAS

‘There is a good possibility that Gauzner-Michl was the murderer’ (Kratzer 2010: 16)

(110) *Es besteht aber immer noch eine geringe Möglichkeit daß*

THERE IS HOWEVER STILL A SLIGHT POSSIBILITY THAT

der Kastenjakl der Mörder war

THE KASTENJAKL THE MURDERER WAS

‘There is, however, still a slight possibility that Kastenjakl was the murderer’ (Kratzer 2010: 16)

(111) *Der Gauzner-Michl kann eher der Mörder sein als der Kastenjakl*
 THE GAUZNER-MICHL CAN RATHER THE MURDERER BE THAN THE KASTENJAKL
 ‘Gauzner-Michl is more likely the murderer than Kastenjakl’ (Kratzer 2010: 16)

(112) *Es ist wahrscheinlich, daß der Gauzner-Michl der Mörder war*
 IT IS PROBABLE THAT THE GAUZNER-MICHL THE MURDERER WAS
 ‘It is probable that Gauzner-Michl was the murderer’ (Kratzer 2010: 16)

English equally has ways of expressing these four grades of modal expressions (Kratzer 1981: 299).

Table 5.1: Kratzer gradable modality (1981)

English	German	Modal expression
There is a good possibility that...	Es kann gut sein daß...	Human possibility
There is a slight possibility that ...	Es besteht eine geringe Möglichkeit daß...	Slight possibility
It is more likely that ... than that...	Es kann eher sein daß... als daß...	Comparative possibility
It is probable that...	Es ist wahrscheinlich daß...	Human necessity

The two conversational backgrounds provide the necessary tools to achieve these different grades of modality. Based on the generalizations presented for Nsyilxcen, given that *cmay* is restricted to possibility contexts it would cover the weakest possibility. *mat* on the other hand covers a large range of modal strength readings that would be a reading stronger than possibility up to necessity.

Table 5.2: Nsyilxcen particles in circumstantial contexts

Modal Expression	Nsyilxcen
Slight possibility	<i>cmay</i>
Human/Good possibility	<i>mat</i>
Human necessity	

For *mat*, Kratzer's definition for good possibility could be adopted.

(113) *Good Possibility (Kratzer 1991: 644)*

A proposition p is a good possibility in a world w with respect to a modal base f and an ordering source g iff there is a world $u \in \bigcap f(w)$ such that for all $v \in \bigcap f(w)$: if $v \geq_{g(w)} u$, then $v \in p$.

If *mat* and *cmay* occupied different positions on the possibility/ necessity scale, a scalar implicature emerges. If the speaker chooses to use *cmay* to make the modal statement, this implies that there is a reason they did not choose the stronger modal *mat*.

This approach does makes certain predictions with respect to what types of contexts *mat* and *cmay* are compatible with. It would predict that *mat* would not be permitted in the weakest contexts where *cmay* is permitted. To determine whether this is the case the data would need to show a weak context where *mat* is infelicitous. This is something which has not yet emerged during elicitations as *mat* appears to always be permitted in the same contexts where *cmay* is permitted. For instance, during elicitations the running example was presented to the consultants with extra emphasis that the speaker is completely uncertain about Mary's whereabouts. It was emphasized that she doesn't run at the same time everyday, she doesn't run the same days each week, she is in school everyday and likes to go shopping at the store when it is open. The intention was to create the weakest context possible. In this case both *mat* and *cmay* were permitted.

(114) Context: You know that Mary loves to go running and often goes on runs randomly. She could also be at the store or at school. I ask you, where is Mary?

- a. *Mary mat ac-qíc-əlx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'
- b. *Mary cmay ac-qíc-əlx*
Mary EPIS.MOD CUST-RUN-LEX
'Mary might be running'

Data such as (33) cast doubt on the idea that *mat* might be a good possibility modal.

5.2 Option #2

For each Douglas Lake consultant there was no consistent default reading for *mat* in out-of-the-blue contexts. As a result an alternative analysis is one where *mat* and *cmay* both have a strictly encoded existential force. To account for the modal force variability for *mat* and the strict modal force interpretations for *cmay*, von Fintel and Iatridou's (2006) analysis for *must/have to* and *should/ought to* can be adapted. In this analysis *mat* would be sensitive to an ordering source allowing for flexible modal force interpretations and *cmay* would not be sensitive to the ordering source.

To begin, von Fintel and Iatridou (2006) explore the intuition that *should/ought to* are weaker than *must/have to*. This can be seen in (115) which shows that there is no contradiction when (115a) is uttered. Therefore, *ought to* is weaker than *have to* (von Fintel and Iatridou 2006).¹⁸

(115)

- a. ✓ You ought to do the dishes, but you don't have to
- b. # You have to do the dishes, but you don't have to (contradiction)

(116) also shows that *ought to* is weaker than *have to* as a stronger modal will entail the weaker reading in (116a) and not the other way around in (116b) (von Fintel and Iatridou 2006: 2).

(116)

- a. ✓ You ought to wash your hands- in fact you have to
- b. # You have to wash your hands - in fact you ought to

von Fintel and Iatridou use Kratzer's standard theory of modality as a framework to achieve the distinction between a weak necessity reading for *should/ought to* and the necessity reading for *must/have to*.

(117)

- a. You **ought to** do the dishes
- b. You **have to** do the dishes

¹⁸These sentences were attempted in Nsyilxcen, however as *mat* is permitted in the same contexts as *cmay* it was difficult to test for these judgments.

The modal base worlds are worlds where the goal is achieved, and von Fintel and Iatridou argue that *should/ought to* and *must/have to* make a distinction between good and the very best worlds amongst the modal base worlds. As these modals are universal quantifiers, the larger the set of accessible worlds the stronger the modal force reading. For a strong necessity modal like *must/have to* the statement in (117b) says that the prejacent is true in all worlds selected by the modal base and primary ordering source. For a weak necessity modal like *should/ought to*, a secondary ordering source adds an additional restriction to the modal base worlds. This means that the prejacent is asserted to be true in an even smaller set of worlds. In this case all of the very best worlds among the accessible worlds are worlds where the prejacent is true. The ordering source propositions in the secondary ordering source have the potential to weaken the force of *should/ought to* down to a possibility reading as shown in figure 5.3. However, von Fintel and Iatridou only consider these modals to cover weak necessity interpretations.

Table 5.3: Necessity and weak necessity

Necessity	must
Weak necessity	should ought to
Possibility	

Similar to *should/ought to*, *mat* is permitted in both necessity and possibility contexts it and will be sensitive to the ordering source to allow for its modal force flexibility. Consider the necessity example repeated below in (118).

- (118) Context: Mary runs every day to train for a marathon. She usually runs at 6pm on Tuesdays. Today is Tuesday and it's 6pm. I ask you, where is Mary?

Mary **mat** *ac-qíc-əlx*

Mary EPIS.MOD CUST-RUN-LEX

'Mary must have gone running'

B(w) Epistemic: { Mary is not at home, Mary trains every Tuesday at 6pm, It is Tuesday at 6pm, Mary has a strict training schedule, etc. }

O(w) Doxastic = { The most important race of Mary's life is on the weekend, etc. }

In this case, the doxastic ordering source would contain propositions that the speaker believes are true. As a result, the modal is quantifying over all the worlds where the evidence holds and where the propositions in the ordering source also hold. As previously discussed, existential quantification over a more restricted set of worlds will yield a stronger reading. In order to allow for the possibility interpretations for *mat* an empty ordering source will not place a secondary restriction on the possible worlds yielding a larger domain of quantification. As a result existential quantification over a non-restricted set of worlds will yield a weaker reading. My proposal for Nsyilxcen is the inverse of the von Stechow and Iatridou (2006) analysis. While they propose a weakening via a secondary ordering source, I propose an analysis involving strengthening of a possibility modal via an empty ordering source.

Next, as discussed throughout this thesis, *cma*y is restricted to possibility contexts. Similar to *must/have to*, the present option will require an additional mechanism that does not allow *cma*y to be sensitive to the ordering source. Therefore, assuming that *cma*y has an existential modal force it will only quantify over the non-restricted set of modal base worlds.

- (119) Context: You know that Mary loves to go running and often goes on runs randomly. She could also be at the store or at school. I ask you, where is Mary?

Mary *cma*y *ac-qic-lx*

Mary EPIS.MOD CUST-RUN-LEX

'Mary might be running'

B(w) Epistemic: { Mary is not at home, It is Tuesday at 6pm, Mary doesn't have a strict training schedule, etc. }

O(w): EMPTY

This analysis accounts for the possibility readings for both *mat* and *cma*y and also allows *mat* to covers a wide range of readings from pure possibility up to the strongest necessity. This is illustrated in figure 5.4.

Table 5.4: Possibility and strong possibility

Necessity	mat
Strong Possibility	
Possibility	mat
	cmay

The lexical entry with an encoded existential modal force for *mat* is provided in (120) based on Peterson’s analysis for =*ima* (Peterson 2010: 179).

(120) $\llbracket \text{mat} \rrbracket^{c,w}$ is only defined if c provides a modal base f such that for all worlds $w' \in \bigcap f(w)$, the inferential evidence in w holds in w' .

If defined $\llbracket \text{mat} \rrbracket^{c,w} = \lambda p. \exists w' [w' \in g(w) (\bigcap f(w)) \wedge p(w') = 1]$

The same lexical entry can be applied to *cmay* and is provided in (121).

(121) $\llbracket \text{cmay} \rrbracket^{c,w}$ is only defined if c provides a modal base B such that for all worlds $w' \in B(w)$, the inferential evidence in w holds in w' .

If defined $\llbracket \text{cmay} \rrbracket^{c,w} = \lambda p. \exists w' [w' \in O(w) (B(w)) \wedge p(w') = 1]$

For both Nsyilxcen and English, the ordering source affects the size of the domain of quantification depending on how many propositions it contains. Assuming that *mat* has a default existential modal force the more propositions in the ordering source, the smaller the domain of quantification and the stronger the modal force reading. Given that *mat* allows for such a wide range of modal force readings it is sensitive to the ordering source. This is similar to *should/ought to* except that the English modals have a universal modal force and therefore the more restricted the domain of quantification the weaker the reading. *cmay* on the other hand is similar to English *must/have to* as it is not sensitive to a non-empty ordering source. In this case *cmay* will take existential quantification over a non-restricted set of modal base worlds yielding a weaker reading. As von Stechow and Iatridou state for *must/have to*, it is necessary to lexically encode that *cmay* is not sensitive to a non-empty ordering source.

However the Nsyilxcen epistemic modals are not identical to English *must/have to* and *should/ought to*. According to von Stechow and Iatridou, *should/ought to* are always weaker than *must/have to* and are always subject to a non-empty secondary ordering source (2008). Whereas in Nsyilxcen, *mat* is felicitous in the same pure possibility contexts where *cmaɣ* is felicitous. In fact, there is no data available to show that *mat* is not permitted in possibility contexts where *cmaɣ* is felicitous. Unlike English *must/have to* and *should/ought to*, the Nsyilxcen data does not differentiate between a possibility and a strong possibility interpretation. Rather an analysis that makes use of the ordering source can account for the variable force interpretations for *mat* and the strict force interpretation for *cmaɣ*.

5.3 Option #3

The third approach is to strictly encode a universal modal force for *mat* - with an additional mechanism to weaken it to an existential modal force - and to strictly encode an existential modal force for *cmaɣ* with an added stipulation that it cannot be strengthened to a universal modal force reading. Assuming *mat* is a universal modal over possible worlds will require an analysis like the ordering source analysis for the St'át'imcets system presented in section 4.1.1. Consider the following necessity context (122).

- (122) Context: Mary runs every day to train for a marathon. She usually runs at 6pm on Tuesdays. Today is Tuesday and it's 6pm. I ask you, where is Mary?

Mary mat ac-qíc-əlx
 Mary EPIS.MOD CUST-RUN-LEX
 'Mary must be running'

$f(w)$ Epistemic: { Mary is not at home, Mary trains every Tuesday at 6pm, It is Tuesday at 6pm, Mary has a strict training schedule, etc. }

For (122) the epistemic modal base consists of propositions supplying what is known from the evidence available to the speaker. In this case, universal quantification over a non-restricted set of worlds will yield the stronger necessity reading. As previously stated, the ordering source will account for the variability of the necessity and possibility readings for *mat*. To get the necessity reading, an empty ordering source will not contain propositions that further restrict the modal base worlds. On the other hand, a non-empty ordering source will pick out a smaller set

of worlds and universal quantification over the smaller set will result in a weaker reading. Consider example (123).

- (123) Context: You know that Mary loves to go running and often goes on runs randomly. She could also be at the store or at school. I ask you, where is Mary?

Mary mat ac-qíc-əlx
 Mary EPIS.MOD CUST-RUN-LEX
 'Mary might be running'

$\cap f(w)$ Epistemic: { Mary is not at home, etc. }

$g(w)$ Doxastic = { Mary attends classes during the week, Mary likes to go shopping }

In this case the doxastic ordering source will consist of propositions that may or may not be true in the actual world. Universal quantification over a restricted set of accessible worlds will yield the weaker possibility reading. The lexical entry for *mat* under this analysis is provided in (124).

- (124) *Lexical Entry for mat (Adapted from Rullmann et al. 2008)*

$\| \text{mat} \|^{c,w}$ is only defined if c provides a modal base f such that for all worlds $w' \in f(w)$, the inferential evidence in w holds in w' .

If defined $\| \text{mat} \|^{c,w} = \lambda p. \forall w' [w' \in g(w) (\cap f(w)) \rightarrow p(w') = 1]$

(124) can be paraphrased as “For all worlds w' if w' is a member of the set of worlds selected by the modal base and ordering source then p is true in w' .”

Next, as presented in chapter 2 *cmay* is restricted to possibility contexts and is infelicitous in necessity contexts as seen in (125) and (126).

- (125) Context: You know that Mary loves to go running and often goes on runs randomly. She could also be at the store or at school. I ask you, where is Mary?

Mary cmay ac-qíc-əlx
 Mary EPIS.MOD CUST-RUN-LEX
 'Mary might have gone running'

(126) Context: Mary runs every day to train for a marathon. She usually runs at 6pm on Tuesdays. Today is Tuesday and it's 6pm. I ask you, where is Mary?

Mary *cmay* ac-qíc-əlx
 Mary EPIS.MOD CUST-RUN-LEX
 'Mary must have gone running'

Like *mat*, the epistemic modal base for *cmay* consists of propositions supplying what is known based on evidence provided by the context.

$\cap f(w)$ Epistemic: { Mary is not at home, Mary is training for a race, Mary does not have a strict training schedule, etc. }

I propose that *cmay* lexically encodes an existential modal force. The following is the lexical entry for *cmay*.

(127) *Lexical Entry for cmay (Adapted from Rullmann et al. 2008 and Peterson 2010)*

$\| \text{cmay} \|^{c,w}$ is only defined if c provides a modal base f such that for all worlds $w' \in f(w)$, the inferential evidence in w holds in w' .

If defined $\| \text{cmay} \|^{c,w} = \lambda p. \exists w' [w' \in g(w) (f(w)) \wedge p(w') = 1]$

(127) can be paraphrased as “There is a world w' such that w' is accessible from the set of worlds selected by the modal base and ordering source and the proposition p is true in w' ”. The speaker’s doxastic ordering source may be non-empty, in which case *cmay* would take existential quantification over a smaller subset of modal base worlds.

$g(w)$ Doxastic = { Mary likes to go shopping, Mary is taking classes during the week, Mary’s most important race of her life is this weekend, etc. }

However, this presents a problem. If *cmay* is an existential quantifier over a smaller set of worlds it will yield a stronger reading. As we cannot prevent the speaker from believing certain propositions we cannot prevent *cmay* from being strengthened. Therefore, the lexical entry needs to lexically encode that *cmay* cannot be strengthened.¹⁹

¹⁹It should be noted that most modal systems will need this type of lexical restriction. For instance, English *should* or *ought* as discussed by von Stechow and Iatridou (2006) needs a secondary ordering source to allow for the weak necessity reading. The stronger modal *must* cannot be weakened via a secondary ordering source.

This analysis argues for a default universal force for *mat* and can be backed up with examples showing that there is an overt way of disambiguating in favor of an existential interpretation. Rullmann et al. (2008) provide examples showing that St'át'imcets also has a way of disambiguating towards an existential interpretation for the inferential modal *k'a*. *k'a* allows for both necessity and possibility readings but has a preferred necessity interpretation. Rullmann et al. (2008) show that when *k'a* is found along side the existential modal *sxek* 'maybe' it yields an existential interpretation as seen in (128).

- (128) *nilh ku cw7aoy-s kw s-k'úl-em múta7 ku pála7 k'a*
 FOC DET NEG-3POSS DET NOM-make-MID again DET one INFER
sxek xetspásq'et
 maybe week
 'So she wouldn't have to make more for about a week maybe'
 (Matthewson 2005: 147-148)

Nsyilxcen also has a way of overtly disambiguating between a necessity and possibility interpretation for *mat*. As this section has argued, *cmay* has a strictly encoded existential modal force and when *mat* and *cmay* are in the same utterance, there is only a possibility interpretation.

- (129) *mat cmay sl' t spiʔsc'ilt*
 EPIS.MOD EPIS.MOD lost OBL yesterday
 'Maybe he must have gotten lost yesterday'

There are other options to account for the variable modal force for *mat* and the strictly encoded existential modal force for *cmay*.

5.4 Implications and further research

To account for the Nsyilxcen data, I propose option # 3 is the best analysis. The ordering source analysis is able to account for the modal force variability of *mat* and the strict modal force of *cmay*. However, whether *mat* has an existential modal force (option # 2) or a universal modal force (option # 3) requires more research. From the empirical data it is not yet clear as to whether *mat* has a default necessity or possibility interpretation. Even though *mat* does not have a preference for a possibility or necessity reading in out-of-the-blue contexts, there is data indicating that it has a universal modal force interpretation (see section 5.3). Further research and data is required to clearly determine the consultants' judgments for *mat*. For

instance, data involving non-upward entailing contexts would aid in distinguishing between option # 2 and option # 3, however attempts at eliciting this data proved difficult and did not yield clear results. Regardless, I propose that option # 3 is the best option as it accounts for the variable modal force of *cmay* and the strictly encoded possibility modal force for *cmay*.

The residual problem with using an ordering source is that there needs to be an extra mechanism that prevents *cmay* from being sensitive to the effects of the ordering source. For instance if *mat* and *cmay* have a lexically encoded existential modal force there will need to be an explanation for why *mat* is strengthened and *cmay* is not. This is also a problem for option # 3 where the ordering source can weaken the universal force for *mat* but does not strengthen the existential modal force for *cmay*. This is a detail that needs to be accounted for in English as well. von Stechow and Iatridou’s (2006) analysis for *must/ have to* and *should/ ought to* must also specify that *must/ have to* is not sensitive to a secondary ordering source.

There are also many interesting questions that were beyond the scope of this thesis. First, an in depth syntactic analysis for the modal system. Secondly, developing a semantic analysis for the reportative $k^w uk^w$ and the bouletic modal cak^w .

The theory of modality as developed by Kratzer (1977, 1981, 1997, 2012) makes predictions about what modal systems can look like. Modal theory along with the methodology of collecting translation and judgment tasks, has revealed both similarities and differences between the modal systems of languages like Nsyilxcen, St’át’imcets, Gitksan, Blackfoot, Javanese, Nez Perce, and English. The partial variability of the Nsyilxcen modal system reveals interesting implications for a cross-linguistic modal typology. Table 5.5 shows that the Nsyilxcen epistemic modals do not fit in with one particular system.

Table 5.5: Cross-linguistic modal typology

	Variable Conversational Background	Encoded Conversational Background
Variable Force		St’át’imcets, Gitksan, Nez Perce- <i>o’qa</i> , Nsyilxcen- <i>mat</i>
Encoded Force	English	Javanese, Nsyilxcen- <i>cmay</i>

In fact, when entire modal systems are considered, none of these languages can be classified based on a simple dichotomy between modal force and conversational background. This fact has also been discussed by Rullmann et al. (2008), Peterson (2010), and Deal (2011). For instance, the empirical data shows that circumstantial and epistemic modals behave in vastly different ways across systems. Matthewson (in press [2]) showed that other languages like St’át’imcets and Gitksan do not fit neatly into a simplified modal typology. Research has revealed that each language covers the modal space in different ways. This is shown in tables 5.6 and 5.7.

Table 5.6: St’át’imcets modal system (Matthewson in press [2]: 9)

		Possibility	Necessity
Circumstantial	Deontic	<i>ka</i>	
	Reportative	<i>ku7</i>	
Epistemic	Indirect Inferential	<i>k’a</i>	
	Inference from results	<i>-an’</i>	

Table 5.7: Gitksan modal system (Matthewson in press [2]: 9)

		Possibility	(Weak) Necessity
Circumstantial	Plain	<i>da’ak(hl)xw</i>	<i>sgi</i>
	Deontic	<i>anook</i>	
Epistemic	Plain	<i>ima(’a)</i>	
	Reportative	<i>gat</i>	

The Nsyilxcen system also expresses possibility and necessity modal force and a circumstantial and epistemic modal base but in a different way from St’át’imcets and Gitksan.

Table 5.8: Nsyilxcen modal system

		Possibility	Necessity
Circumstantial	Bouletic	<i>cak^w</i>	
Epistemic	Plain	<i>mat</i>	
		<i>cmay</i>	
	Reportative	<i>k^wuk^w</i>	

Finally, the English modals cover a different semantic space from Pacific Northwest languages.

Table 5.9: English modal system

		Possibility	Weak Necessity	Necessity
Circumstantial	Plain	<i>can</i>	<i>should</i>	<i>must</i>
	Deontic	<i>may</i> <i>can</i>		
Epistemic	Plain	<i>might</i>		

Cross-linguistic comparison of modal systems reveals the extent to which languages choose to divide up the semantic modal space. Gaps in the lexicon not only reveal that modal systems should not be compared in their entirety, they also provide interesting insight into what formal notions languages can do without. Deal's (2011) discussion of Nez Perce modality calls into question the *Effability Hypothesis*, which in its strongest form states all languages will have a way to express any proposition (Keenan 1978, Katz 1976). In reality, as Deal showed with Nez Perce, languages are not required to express every type of notional or formal category (2011:36). Matthewson (in press [2]) provides further support for this argument with data from multiple modal systems like S'át'imcets, Gitksan, Blackfoot, and Javanese. The Nsyilxcen non-epistemic modal system also provides empirical evidence supporting this conclusion. Similar to how Nez Perce speakers paraphrase to express notions of circumstantial necessity, Nsyilxcen speakers also paraphrase to express certain types of circumstantial modality.

Matthewson (in press [2]) discusses that using theory as a basis for elicitations will provide a fuller and more accurate empirical picture of the extent and nature of diversity. What theoretically informed semantic fieldwork has revealed is that languages can divide the modal space in many different ways and the more languages that are involved in typological research the more diversity that is uncovered. Due to this diversity most modal systems cannot be classified in their entirety based on a simple dichotomy between conversational background and modal force. This thesis provides further support for this claim and the Nsyilxcen data also indicates that even parts of modal systems, like the epistemic modality, may not be directly compared as a whole across languages.

Chapter 6

Conclusion

The goal of this thesis was to document both epistemic and non-epistemic modality in the Nsyilxcen language with a special focus on providing a semantic analysis for the epistemic modals *mat* and *cmay*. My fieldwork on Nsyilxcen has looked at four modal particles. Two epistemic modals *mat* and *cmay*, the reportative $k^w uk^w$, and one circumstantial modal cak^w .

The empirical data shows that *mat* and *cmay* are both strictly epistemic modals and are not felicitous in non-epistemic contexts. Furthermore these modals specify that indirect inferential evidence was used to make the modal statement. Where these two modals differ is with respect to their modal force, where *cmay* is felicitous in a subset of the contexts where *mat* is felicitous. Next, $k^w uk^w$ is an epistemic modal and expresses that the source of evidence comes from a report. Finally there is one non-epistemic modal cak^w that is felicitous in bouletic contexts. To express notions of circumstantial, deontic, teleological, and ability non-epistemic modality the Nsyilxcen speakers paraphrase using a variety of different particles.

This thesis also proposes a formal semantic analysis for *mat* and *cmay* which makes use of an ordering source. The formal analysis discussed in this thesis is based on Kratzer (1977, 1981, 1991, 2010), Matthewson et al. (2007), Rullmann et al. (2008), and Peterson (2010). The variability of the modal force for *mat* arises due to a contextually determined ordering source that either contains propositions which restrict the domain of quantification or is empty and does not affect the domain of quantification. I propose in section 5.3 that *mat* lexically encodes a universal modal force. To account for its variable modal force interpretations, I also propose that *mat* is sensitive to the ordering source. As a result, if there is a non-empty ordering source then the domain of quantification will be restricted. Universal quantification over a smaller set of worlds yields a weaker reading. If the ordering source is empty, universal quantification over a non-restricted set of worlds will yield a stronger reading. As *cmay* does not have variable modal force interpretations, it will not be sensitive to the ordering source and will always take existential quantification over the largest set of possible worlds selected by the modal base. Existential quantification over a non-restricted set of worlds will yield a weaker possibility-like interpretation.

The overall implications of this thesis provides further support for the discussion that all languages will have a way to express all types of modality making cross-linguistic comparison impossible. Empirical data from multiple languages point towards more diversity than similarities. Languages cannot be lumped into simple dichotomy between strength and force.

Chapter 7

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