Inclusive plurals and the theory of number[1]

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Comments welcome!

Abstract. This paper proposes a solution to the problem of inclusive plurals as it arises in Harbour's (2014) compositional theory of grammatical number. After arguing that analyses of the plural like Sauerland (2003) and others are incompatible with Harbour's theory, I offer a solution that involves the following claims: (a) a category of general number exists in languages with inclusive plurals, (b) general number in these languages is spelled out via the plural forms of nouns, (c) general number has inclusive semantics, and (d) the plural forms of nouns additionally denote strict semantic plurality. The proposal defended here only adds (a) and (b) to Harbour's system, making use of the rest of his apparatus to explain the data. It borrows (d) from the ambiguity approach to the plural in Farkas and de Swart (2010). I argue that ambiguity is less costly in my proposal, and that the more nuanced understanding of strict semantic plurality that Harbour affords is necessary. I then show that my account can be extended to cover cases in which plural forms are used when other numbers are facultative.

Keywords: grammatical number, inclusive plurals, general number, exclusive plurals, facultative number

1 Introduction: number semantics of plural count nouns

The problem of inclusive plurals is illustrated in (1)-(2): plural forms of nouns in English, such as *tomatoes*, seem to introduce pluralities (or plural individuals[2]) in examples such as (1), but both singularities (or singular, or atomic individuals) and pluralities in examples such as (2) (from Sauerland 2003):

(1) *English*
Lina harvested tomatoes

(2) *English*
Lina didn't harvest tomatoes

For (1) to be true, Lina has to have harvested at least two tomatoes and is thus concerned with pluralities each of which is constituted of two or more atoms. However, the negation of this sentence, in (2), requires Lina not to have harvested any tomatoes

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[2] As in Link (1983) and much subsequent work.

at all—neither one (a singularity) nor more than one (a plurality). If the plural form *tomatoes* in (2) introduced pluralities only, we would expect the sentence to be true in situations in which Lina harvested only one tomato (which does not constitute a plurality), contrary to fact. Plural forms such as *tomatoes* in (2) are known as inclusive plurals, since they introduce both singular and plural individuals into the semantics of the sentence. Exclusive plurals are plural forms that introduce only plural individuals. The issue is: what do these data show about the denotation of plural noun forms? Are plural forms always inclusive? Are they ambiguous between an inclusive and an exclusive interpretation? These questions, their answers, and their consequences have received a lot of attention in the formal semantics literature (see Farkas and de Swart 2010, Grimm 2012, Krifka 1989, 1995, Lasersohn 1998, 2011, Sauerland 2003, Sauerland, Anderssen and Yatsushiro 2005, Spector 2007, Yatsushiro, Sauerland and Alexiadou 2017, Zweig 2009, and Kiparsky and Tonhauser 2012 for an overview).

Harbour (2014) proposes a compositional theory of number that derives all and only the possible number systems in the languages of the world from a small set of semantic and syntactic primitives. In his system, plural forms are unambiguously exclusive, and the problem of inclusive plurals arises. In this paper I show that a proposal to solve the inclusive plurals problem that postulates unambiguous plural forms, such as Sauerland (2003) and others, undergenerates when considered together with Harbour's proposal. The undergeneration problem arises in languages that have number values such as dual or paucal, number values that are compositionally built on the basis of Harbour's semantically contentful feature [−atomic]. A Sauerland-style approach to the inclusive plurals problem predicts that such languages should not have inclusive plurals, contrary to fact. The main goal of this paper is to provide a solution to this problem that preserves the explanatory power of Harbour (2014).

My solution maintains Harbour (2014), and, in addition, provides independent justification for Farkas and de Swart's (2010) ambiguity proposal, making it less costly to assume that plural forms in languages with inclusive plurals are ambiguous. I propose that inclusive plurals are actually the expression of general number, a number distinction that some languages express overtly as a separate category, as shown in Corbett (2000)—inclusive plurals are thus subsumed under general number. The proposal defended below is more sophisticated in its treatment of exclusive plurals as well, as these are predicted not to be equal across languages in Harbour's system, a prediction that is confirmed empirically.

In addition, I argue that facultative number plurals, that is, plurals which are used instead of other number values (see Corbett 2000), have a general number source. Corbett (2000: 42-50, 93-4) observes that languages with facultative number overwhelmingly use plural forms instead of facultative number values. In my proposal, this follows from the fact that it is plural forms in their general number meaning that have the semantics required for this task.

While the problem of inclusive plurals and the problem of facultative number plurals are quite pressing in Harbour's theory, the issues arise, more generally, in any approach to number. However, to my knowledge, Dvorak and Sauerland (2006) is the only previous attempt in the formal semantics literature to address both of these problems (for the particular case of English and Slovenian). My argument below is that Dvorak and Sauerland's proposal loses the explanatory power of Harbour's approach.

The empirical focus of the paper is the semantics of common, count nouns. Of course, pronouns and other noun phrase-related categories, such as determiners, and categories that go beyond the nominal domain, such as verbs, may also display

grammatical number (see Corbett 2000 for many illustrations of these, in many languages). Pronouns are special, since, typically, languages display grammatical number on them, and the theory of number that I use below draws heavily on pronominal paradigms. While nothing in what I will say here suggests that pronouns should be excluded from consideration, reasons of space and of access to native speakers of the relevant languages prevent me from systematically studying their semantics in this paper. For example, I will not draw firm conclusions about the existence of inclusive plural pronoun forms (but see Harbour 2016: 149-152 for some discussion). I will not have anything to say about the semantics of mass nouns either.

The paper is organized as follows. Section 2 introduces the basics of Harbour (2014). Section 3 discusses the problem of inclusive plurals in more detail and provides an argument against solutions that involve doing away with [–atomic], such as Krifka (1989, 1995), Lasersohn (1998, 2011), Sauerland (2003), Sauerland, Anderssen and Yatsushiro (2005), or Spector (2007). The argument is based on the existence of languages with both dual/paucal forms of nouns and inclusive plurals. Section 4 presents my solution to the problem in detail, and provides arguments against yet other possible solutions. Section 5 discusses facultative number plurals. Section 6 concludes.

2 Harbour (2014)

It is well-known that languages make grammatical number distinctions that go beyond singular and plural: one can find number inflection for dual, trial, minimal, augmented, paucal, or greater plural, among others, as discussed in Corbett's (2000) seminal typological study of number systems. I will illustrate here with languages that contain duals and/or paucals in addition to singular and plural, as these will be the most relevant for us later on. The reader is referred to Harbour (2011, 2014) for detailed discussion of other number values.

Consider Ljubljana Slovenian, a dialect of Slovenian spoken in and around Ljubljana. As shown in the (partial[3]) paradigm of noun inflection in **Table 1**, Ljubljana Slovenian distinguishes singular, dual and plural. These distinctions are most noticeable in the masculine declension, with a significant amount of syncretism of the dual with the plural in the feminine and neuter declensions (Rok Žaucer, p.c.; cf. Derganc 2003, Herrity 2016, Marušič and Žaucer to appear, Toporišič 2000 for standard Slovenian):

		NOM	ACC	GEN	LOCATIVE	DATIVE	INSTRUMENTAL
MASC	SING	stol	stol	stola	pri stolu	Stolu	s stolom
stol	DUAL	stola	stola	stolov	pri stolih	stolom(a)	s stoloma/s stoli
'chair'	PLURAL	stoli	stole	stolov	pri stolih	stolom	s stoli
FEM	SING	hiša	hišo	hiše	pri hiši	hiši	s hišo
hiša	DUAL	hiše	hiše	hiš	pri hišah	hišam(a)	s hišama/s hišami
'house'	PLURAL	hiše	hiše	hiš	pri hišah	hišam	s hišami
NEUT	SING	mest	mest	mesta	pri mestu	mestu	z mestom
mesto	DUAL	mesta	mesta	mest	pri mestih	mestom(a)	z mestoma/z mesti
'town'	PLURAL	mesta	mesta	mest	pri mestih	mestom	z mesti

Table 1 Ljubljana Slovenian nouns

[3] There is a second declension for feminine nouns in (Ljubljana) Slovenian which is not shown here.

The dual is being lost in southern dialects of Slovenian, though it is still robust in central and northern dialects (see Marušič and Žaucer to appear for more discussion). Signs that the dual is robust in Ljubljana Slovenian are that it is part of the regular inflectional paradigm of nouns (i.e., it is not restricted to just a few nouns) and that it displays its own dual agreement patterns with other elements (adjectives, verbs, etc.)[4, 5].

Some languages have a grammatical number value of paucal. Paucal forms are used when the number of real-world entities concerned is small in number. Consider the number system of Bayso, a Cushitic language spoken in Ethiopia, whose nouns distinguish singular, paucal and plural (Corbett 2000, 2012: 224-33, Corbett and Hayward 1978, Hayward 1979)(in addition to general number, discussed in section 4):

	SINGULAR	PAUCAL	PLURAL
lion	lubántiti	lubanjaa	lubanjool
bull	áartiti	aaraajaa	aaraar
sister	abbati	abbajaa	abbalaal
bird	kimbírtiti	kimbirjaa	kimbirjool
ear	nebeti	nebejaa	nebebboo

Table 2 Bayso nouns

Paucal forms, such as *lubanjaa* 'lion.PAUC' in (3)b, indicate that a small number of lions is involved, from two to about six (Corbett 2000: 22) (verbal agreement for the paucal is in the plural; this agreement pattern is found with plural pronouns as well):

(3) *Bayso*
a. Lubán-titi hudure
lion-SG sleep.PAST.MASC.SG
'A single/particular lion slept'
b. Luban-jaa hudureene
lion-PAUC sleep.PAST.PL
'A few lions slept'
c. Luban-jool hudure
lion-PL sleep.PAST.MASC.SG
'Lions slept'

[4] The plural-syncretic nominative dual forms trigger obligatory dual subject-verb agreement, as shown in (i), so, featurally, they are separate dual forms (Rok Žaucer, p.c.):

(i) Dve rože cvetita/*cvetijo
Two. NOM.FEM.DU flower.NOM.FEM.DU are.blossoming.DU/are.blossoming.PL
'(The) two flowers are blossoming'
(ii) Tri rože cvetijo
Three.NOM.FEM.PL flower.NOM.FEM.PL are.blossoming.PL
'(The) three flowers are blossoming'

[5] Abbreviations in glosses are as follows: 1 = first person; 2 = second person; 3 = third person; ABSOLUTIVE = absolutive case ACC = accusative case; ANIM = animate; AUX = auxiliary; DAT = dative case; DEF = definite; DEM = demonstrative; DU = dual; ERG = ergative case; FEM = feminine; GEN = genitive case; GENERAL = general number; INANIM = inanimate; INDEF = indefinite; INDIC = indicative; INTRAN = intransitive; MASC = masculine; NEG = negation; NEUT = neuter; NOM = nominative case; PAST = past tense; PAUC = paucal; PL = plural; POSS = possessive; PREP = preposition; PRON = pronoun; PTC = participle; Q = question operator; SG = singular; TRAN = transitive.

Paucal is an approximative number. This means that how many lions are said to be sleeping in an example like (3)b may vary slightly from speaker to speaker or from situation to situation (e.g., for some speakers, the upper bound may not be six but five, etc.; cf. English *a few*).

Consider also Biak, an Austronesian language spoken in Indonesia, which distinguishes singular, dual, paucal and plural on verbal agreement markers, determiners, demonstratives, and possessive pronouns, as shown in Dalrymple and Mofu (2013). **Table 3** shows the number distinctions made on (proximal) demonstratives and definite determiners in this language:

	SINGULAR	DUAL	PAUCAL	PLURAL (ANIM)	PLURAL (INANIM)
Proximal demonstrative	ine	suine	skoine	sine	na(i)ne
Definite determiner	i/ya	sui/suya	skoi/skoya	si/sya	na

Table 3 Biak demonstratives and definite determiners

Even though Biak nouns themselves do not (overtly) mark these distinctions, elements that accompany them in the noun phrase do. (4) provides some examples (from Dalrymple and Mofu 2013: 45)(the range of the paucal starts at three and may go up to about ten; Mary Dalrymple, p.c.):

(4) *Biak*

a. Rum ine i-wawa
house DEM.SG 3SG-shake
'This house is shaking'

b. Rum suine su-wawa
house DEM.DU 3DU-shake
'These (two) houses are shaking'

c. Rum skoine sko-wawa
house DEM.PAUC 3PAUC-shake
'These (several) houses are shaking'

d. Rum nane na-wawa
house DEM.PL.INANIM 3PL.INANIM-shake
'These (many) houses are shaking'

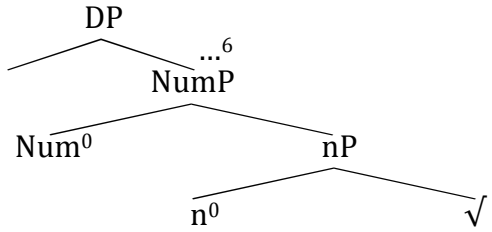
In addition to the systems here exemplified, the cross-linguistic typology of number includes languages with no number (Pirahã, as in Everett 1986, or Dëne Sųłiné, as in Wilhelm 2008), singular-dual-lesser paucal-greater paucal-plural systems (e.g., Sursurunga, as in Corbett 2000: 26-30; cf. Hutchisson 1986), singular-dual-trial-paucal-plural systems (e.g., Marshallese), minimal-augmented systems (e.g., Winnebago), and others (for the latter two, see Harbour 2014 and references cited there). However, there are no attested number systems that distinguish, for example, just singular from dual, or paucal from plural, or trial from plural, or trial from paucal. The full set of cross-linguistic generalizations is in (5) (cf. Greenberg 1966):

(5) Trial requires dual
Dual requires singular
Singular requires plural

Plural requires singular or minimal
Unit augmented requires augmented
Minimal requires augmented or plural
Augmented requires minimal
Greater paucal requires (lesser) paucal
Paucal requires plural
Greater (and global) plural requires plural or augmented

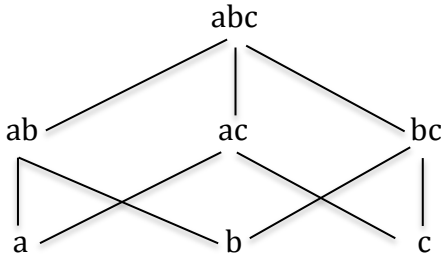
The challenge for a theory of number whose goal is to account for the cross-linguistic expression of number is to explain the important fact that not all logically possible number value combinations constitute possible number systems. Harbour's (2014) theory postulates the smallest number of primitives/features that derive the possible number systems while explaining why the impossible systems are impossible, that is, that derive the generalizations in (5). It also provides the basis on which to explain the morpho-phonological and morpho-syntactic realization of features in different languages. His main assumptions are as follows: (a) NumP takes nP as complement, as in (6), (b) n^0 assigns roots to the category of nouns and structures them into semilattices, (c) only three features can appear in Num^0: [±additive], [±atomic], [±minimal], as in (6), (d) these features operate on the lattices provided by nP, (e) the repetition of a particular feature in Num^0 may or may not be allowed in a language, and (f) the semantic range of the [±additive] cut is subject to social convention. We will consider assumptions (a)-(d) and (f) in what follows (assumption (e) is necessary to derive number values like minimal, augmented, unit augmented, trial, lesser and greater paucals, and others; see Harbour 2011, 2014 for more details). Assumptions (a), (b) and (d) are quite commonly made in the literature:

(6)



Assuming a simplified model with just three individuals in it, a, b and c, what n^0 is taken to do to roots is to structure them into the join semilattice in (7). (8) is the set-theory equivalent:

(7)



(8) [[nP]] = {a, b, c, ab, ac, bc, abc}

[6] Other projections inside DP are of course possible, but they are irrelevant for the purposes of this paper.

The semantics for the number features is assumed to be as follows[7]:

(9) [[+atomic]] = λP.λx. P(x) & atom(x)
[[−atomic]] = λP.λx. P(x) & ¬atom(x)

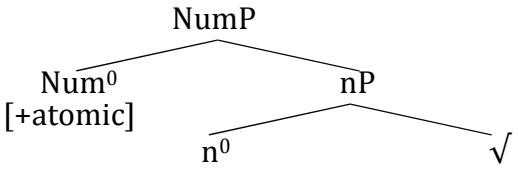
(10) [[+minimal]]=λP.λx. P(x) & ¬∃y P(y) & y⊏x
[[−minimal]]=λP.λx. P(x) & ∃y P(y) & y⊏x

(11) [[+additive]] = λP.λx. Q(x) & Q⊏P & ∀y Q(y)→Q(x⊔y)
[[−additive]] = λP.λx. Q(x) & Q⊏P & ¬∀y Q(y)→Q(x⊔y)

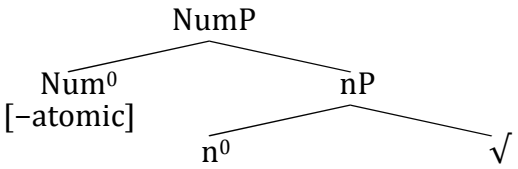
[±Atomic] is sensitive to atoms/singularities ([+atomic]) vs. non-atoms/pluralities ([−atomic]). [±Minimal] is sensitive to elements with parts ([−minimal]) vs. elements without parts ([+minimal]). [±Additive] is concerned with whether the output set contains, for any two of its members, their join ([+additive]) (a property also known as cumulativity; cf. Krifka 1989) or not ([−additive]).

To see how this works, let's start by considering a simple singular-plural system. Such a system allows only (12) and (13), that is, the only features that can appear in Num^0 are [±atomic]:

(12)



(13)



The resulting semantics is as follows:

(14) [[(12)]]=[[NumP]]=[[+atomic]]([[nP]]) = λx. [[nP]](x) & atom(x)
(15) [[(13)]]=[[NumP]]=[[−atomic]]([[nP]]) = λx. [[nP]](x) & ¬atom(x)

(14) gives rise to a singular semantics, and (15), to a strictly plural semantics[8].

As Harbour (2011) observes, the same result is obtained if a system allows just [±minimal] in Num^0 (and does not allow repetition of features, (e)), since the set of

[7] I deviate from Harbour in that I treat the contribution of the number features to be entirely made up of entailments, whereas for him some of their content is presupposed. Nothing of what I say here depends on this. [±Atomic] is of type <e,t>, not <et, et>, in his proposal, but, again, the difference is not important here. Q is a free variable, ⊔ stands for join, and ⊏ is the proper part-of relation.

[8] Given the semantics of [±atomic], it will not be possible to repeat a feature of Num^0, as per assumption (e) above, since nothing can satisfy (i):

(i) [[+atomic]]([[−atomic]]([[nP]]))=[[−atomic]]([[+atomic]]([[nP]]))=λx.[[nP]](x) & ¬atom(x) & atom(x)

Footnotes 9 and 10 provide some detail into the workings of assumption (e).

elements in (7) that have no subparts ([+minimal]) coincides with the set of atoms ([+atomic]), and the set of elements in (7) that have subparts ([−minimal]) coincides with the set of non-atoms ([−atomic]). Thus, there might be cases where it is not possible to distinguish [±minimal] from [±atomic]. However, there are cases in which the two do come apart. One such case is provided by systems with dual number, such as Ljubljana Slovenian, which are argued to use both [±atomic] and [±minimal]. Consider the following feature combinations (cf. Noyer 1992, Harbour 2011):

(16) a. [[+minimal]]([[+atomic]]([[nP]])) = (singular)
= λx. [[nP]](x) & atom(x) & ¬∃y atom(y) & y⊏x
b. [[+minimal]]([[−atomic]]([[nP]])) = (dual)
= λx. [[nP]](x) & ¬atom(x) & ¬∃y ¬atom(y) & y⊏x
c. [[−minimal]]([[−atomic]]([[nP]])) = (plural)
= λx. [[nP]](x) & ¬atom(x) & ∃y ¬atom(y) & y⊏x
d. #[[−minimal]]([[+atomic]]([[nP]])) =
= λx. [[nP]](x) & atom(x) & ∃y atom(y) & y⊏x

The feature combination in (16)a yields the singular number value. Both (16)b and (16)c will be crucial for us: (16)b yields the dual number value (informally, [−atomic] eliminates the atoms, and [+minimal] chooses the bottommost layer of the lattice after that, which is constituted by all the pluralities each of which is constituted of two atoms). Since nothing can satisfy (16)d (atoms do not have atoms as proper parts), (16)d does not give rise to a number value and is ruled out. This decompositional analysis of the dual into [−atomic] and [+minimal] is attractive for a number of reasons. First, there is no need to postulate a primitive feature [DUAL]. Instead, the derivation of this number value is achieved by features, [+minimal] and [−atomic], that are justified separately elsewhere (for more on [+minimal], see Harbour 2011 and footnotes 9 and 10). This in turn means that the implicational universals in (5) concerned with the dual follow from the fact that the feature [−atomic] is used. Those universals say that there is no language with a dual that doesn't also have singular and plural. If [−atomic] is used for the dual, then other numbers that make use of this feature value, such as plural, must also be present in the system, and if [−atomic] is used, then [+atomic] is used too, which is involved in the singular. Patterns of morphological realization and agreement in different languages can also be explained (see Noyer 1992 and Harbour 2014 for examples). That dual is mastered later than plural in first language acquisition, and that it can be lost without losing the plural, also follow in this approach (see Nevins 2011 for more discussion).[9, 10]

[9] Another such case is provided by systems that make a distinction between first person inclusive (the combination of speaker and hearer) and first person exclusive (just the speaker). In these systems, [+minimal](P) ≠ [+atomic](P), for the combination of speaker and hearer is not an atom but constitutes the most minimal element that can be chosen from the speaker-hearer combination. Minimal-augmented systems like that of Winnebago, a Siouan language spoken in the US (Noyer 1992, Harbour 2011), and minimal-unit augmented-augmented systems like that of Rembarrnga, a Northern Australian language (Corbett 2000: 166, Harbour 2011, McKay 1978), make use of [±minimal], and Rembarrnga allows its repetition ((e)).

[10] Consider also the trial. This is a number value that arises in systems that use both [±minimal] and [±atomic], and where [±minimal] is allowed to repeat (assumption (e)). Such a system gives rise to four well-formed feature combinations and two ill-formed ones. The four well-formed combinations yield singular, dual, trial and plural. Trial is derived as follows:

Paucals are derived using the feature [±additive], which is subject to the additional constraint ((f) above) that its semantic range is subject to social convention. Let's consider the simplest system that contains a paucal, a [±additive, ±atomic] system, exemplified by Bayso above:

(17) a. [[−additive]]([[+atomic]]([[nP]]) = (singular)
= λx. Q(x) & Q⊏[[+atomic]]([[nP]]) & ¬∀y Q(y)→Q(x⊔y)
b. [[−additive]]([[−atomic]]([[nP]])) = (paucal)
= λx. Q(x) & Q⊏[[−atomic]]([[nP]]) & ¬∀y Q(y)→Q(x⊔y)
c. [[+additive]]([[−atomic]]([[nP]])) = (plural)
= λx. Q(x) & Q⊏[[−atomic]]([[nP]]) & ∀y Q(y)→Q(x⊔y)
d. #[[+additive]]([[+atomic]]([[nP]])) =
= λx. Q(x) & Q⊏[[+atomic]]([[nP]]) & ∀y Q(y)→Q(x⊔y)

[±Additive] is defined with reference to a proper subset Q of the characteristic set of the function denoted by its input. (17)a yields singular number. It denotes the set of atomic elements x in Q such that for not all combinations of x with other elements y is it the case that their join is in Q. Constraint (f) is not particularly evident in this feature combination because [+atomic] alone already characterizes the set of atoms. But it is more in evidence in (17)b, which yields paucal number. (17)b denotes the set of non-atomic elements x in Q such that for not all combinations with other elements y is it the case that their join is in Q. The semantic range of the [−additive] cut is subject to social convention, and this means that the size of Q might vary from speaker to speaker (or from community of speakers to community of speakers). This is as it should be, for paucal number is an approximative number, not an exact number—its approximative nature is well documented in the literature (see Corbett 2000 for more). If the cut for this feature is relatively low, the paucal thus generated will be concerned with a small number of real-world entities, perhaps between two and five. Not all speakers of this language might agree, as per (f), and some may set the upper limit at, e.g., six. (17)c yields plural number. (17)d yields no number value, as a set of atoms cannot be cumulative. Paucal number is not postulated as a primitive [PAUCAL]. This again has the advantage of allowing us to explain universals about paucal number. For example, there is no language that has paucal number without also having plural number—this follows from the fact that the feature [−atomic] is used in deriving both the plural and the paucal, but the paucal requires an additional ingredient, [−additive][11].

Consider, finally, the possibility that a language might make use of the three features [±additive], [±minimal] and [±atomic]. Such a system gives rise to the following number distinctions:

(i) [[+minimal]]([[−minimal]]([[−atomic]]([[nP]]))) =
= λx. ¬atom(x) & ∃y [¬atom(y) & y⊏x] & ¬∃y'∃y''[¬atom(y'') & y''⊏y' & y'⊏x]

(i) is the set of all elements x for which all subelements y'' of subelements y' are atomic—this is only satisfied for elements x that are constituted of exactly three atoms, and trial number is derived. The fact that trial requires dual ((5)) follows from the fact that the dual is generated with a subset of the features used for the trial ([+minimal] and [−atomic], as in (16)b).

[11] Cuts for [±additive] that are relatively high will give rise to other approximative number values, such as greater plurals. The feature [±additive] is argued in Harbour (2014: 196-7) to be subject to further constraints, e.g., only horizontal cuts of certain kinds are allowed.

(18) a. [[−additive]]([[+minimal]]([[+atomic]]([[nP]]))) = (singular)
= λx. Q(x) & Q⊏[[+minimal]]([[+atomic]]([[nP]])) & ¬∀y Q(y)→Q(x⊔y)
b. [[−additive]]([[+minimal]]([[−atomic]]([[nP]]))) = (dual)
= λx. Q(x) & Q⊏[[+minimal]]([[−atomic]]([[nP]])) & ¬∀y Q(y)→Q(x⊔y)
c. [[−additive]]([[−minimal]]([[−atomic]]([[nP]]))) = (paucal)
= λx. Q(x) & Q⊏[[−minimal]]([[−atomic]]([[nP]])) & ¬∀y Q(y)→Q(x⊔y)
d. [[+additive]]([[−minimal]]([[−atomic]]([[nP]]))) = (plural)
= λx. Q(x) & Q⊏[[−minimal]]([[−atomic]]([[nP]])) & ∀y Q(y)→Q(x⊔y)

Indeed, Biak, as described in section 1, is such a number system (feature combinations not shown in (18) yield no number values), with the cut for [±additive] conventionally set to low. A difference between Biak and other number systems we've seen before is that the locus of the morpho-phonological realization of number features is not on nouns in this language but on other elements, in the noun phrase or elsewhere.

Additional possible and impossible number values and number systems follow from the basics of the theory as presented here.

Importantly, we have seen that in this theory [−atomic] is used not only in the derivation of plurals but also in the derivation of duals and paucals (in addition to trials, see footnote 10). Plural number here is always at least [−atomic], and sometimes a combination of [−atomic] with other features. This entails variation in the range of the plural—e.g., in a singular-dual-plural system, plural number arises from [−minimal, −atomic] and is thus for three or more real-world entities. In a language in which plural number is just [−atomic], that is, in a singular-plural system, the plural is predicted to be concerned with *two* or more real-world entities. While it is in fact empirically the case that not all plurals are created equal, as we will see in section 4 in more detail, the semantic range of the plural goes beyond what is predicted by Harbour, as in some languages and in some contexts, plurals can even be concerned with *one* or more real-world entities. It is to these and related issues that we now turn.[12]

3 The inclusive plurals problem

3.1 Two types of solutions

Let us consider (1) and (2) again, repeated here:

(19) *English*
Lina harvested tomatoes

(20) *English*
Lina didn't harvest tomatoes

Inclusive plurals occur not only in contexts such as (20) or (21), but also in other downward-entailing contexts, such as (22) (restriction of *no* or *few*), (23) (*if*-clause) or (24) (restriction of a universal quantifier), and in questions, as in (25). Further examples of English exclusive plurals are provided in (26):

[12] Rothstein (2010) argues that atomicity is context dependent, as can be seen from the fact that what counts as a single fence, twig, or line may vary. Harbour does not build context-dependent atomicity in his account, but this could be done via a head embedded in nP, or via n itself, which introduces a function that is sensitive to Rothstein's *counting context*.

(21) *English*
a. I don't have children
b. Dogs are not barking outside

(22) *English*
Few/no students came to the party

(23) *English*
[Directed at one person:]
If you spot horses in this picture, you will get a prize

(24) *English*
Every house with windows overlooking the ocean is overpriced

(25) *English*
[Directed at one person:]
a. Have you ever seen horses in this meadow? (Farkas and de Swart 2010)
b. Did you eat apples today?

(26) *English*
a. I have children
b. Dogs are barking outside (Carlson 1977)

It is important to notice that inclusive plurals do not occur just in arguably non-existential, generic, or law-like sentences, such as (21)a, (24) or (25)a—they also occur in plain episodic, existential sentences such as (20), (21)b, (22), (23), or (25)b. That is, inclusive interpretations of plurals cannot be blamed on sources other than plural semantics (see section 4.3 for more details on this argument). This can also be seen in the fact that, in other languages, plurals in sentences of the same form receive *exclusive*, not inclusive, interpretations:

(27) *Turkish* (Görgülü 2012)
Çocuk-lar-ın var mı?
child-PL-GEN exist Q
'Do you have two or more children?'

(28) *Western Armenian* (Bale *et al.* 2011, Bale and Khanjian 2014)
Bəzdig-ner unis?
child-INDEF.PL have.2SG
'Do you have two or more children?'

(29) *Western Armenian* (Bale *et al.* 2011, Bale and Khanjian 2014)
Amen mar vor bəzdig-ner uner vodk-i gajne-tsav
all person that child-INDEF.PL had foot-GEN/DAT stand-up
'Everyone who had two or more children stood up'

(30) *Brazilian Portuguese* (Martí 2008, Müller 2002)

O	João	não	tem	filhos
DEF	João	not	have.3SG	child.PL

'João does not have (two or more) children'

Evidence from English is usually taken to show that plural forms are not strictly plural semantically, and are, instead, number-neutral, as in Krifka (1989, 1995), Lasersohn (1998, 2011), Sauerland (2003), Sauerland, Anderssen and Yatsushiro (2005), Spector (2007), or Yatsushiro, Sauerland and Alexiadou (2017). In Harbour's terms, these can all be said to be proposals that dispense with [−atomic]. The basic idea of this first type of solution to the inclusive plurals problem is that the denotations of singular and plural forms are as follows:[13]

(31) a. [[cat]] = λx. x is a cat & atom(x)
b. [[cats]] =λx. x is a cat

(31)a assigns an atomic semantics to singular forms, and (31)b assigns a number-neutral semantics to plural forms. The number-neutral denotation of plural forms is most evident in downward-entailing contexts and questions. Consider a negative context such as (21)a. Systems that do away with [−atomic] straightforwardly assign the proposition that the speaker doesn't have any children to (21)a. This entails other propositions, such as that the speaker doesn't have one child. Because the former is stronger (or more informative) than the latter, no competition with other forms/meanings ensues and the example keeps its inclusive interpretation. In upward-entailing contexts, however, the proposition that the speaker has one child entails the proposition that s/he has one or more children. The inclusive interpretation is now weaker than other propositions, and Gricean competition ensues. Since the speaker didn't choose the more informative proposition, the hearer concludes that the speaker doesn't have one child and that s/he has more than one—that's the exclusive reading that we indeed find attested in (20).[14]

This kind of solution involves modifying Harbour's theory so that the features [+atomic] and [−atomic] do not necessarily go together in a given number system. More specifically, it involves the claim that the presence of [+atomic] in a number system does not entail the presence of [−atomic]. Languages not making use of [−atomic] would be those with inclusive plurals, like English. Languages making use of [−atomic] would be those that do not have them, their plurals being always exclusive instead, such as Turkish, Western Armenian, or Brazilian Portuguese.

A different solution is defended by Farkas and de Swart (2010) (see also Grimm 2012, discussed in section 4.3). For Farkas and de Swart, plural forms in a language like

[13] (31) is an adaptation, in Harbour's terms, of the proposals just mentioned. As far as I can tell, none of them actually propose (31). For example, for Sauerland (2003), atomicity is a presupposition, not an entailment, of singular number. He appeals to pragmatic reasoning and competition too, but for him the principle involved is Maximize Presupposition. Spector (2007) appeals to competition with alternative forms and their implicatures and is not explicit about the details of the contribution of the singular. The arguments made in this paper do not revolve around the presupposition vs. entailment status of the content of number features.

[14] Questions are not, strictly speaking, downward-entailing (though NPIs are licensed in questions; Ladusaw 1996, Guerzoni and Sharvit 2007) and are, implicitly or explicitly, put aside in all accounts.

English are ambiguous between the number-neutral, inclusive denotation in (31)b, and the strictly plural, exclusive denotation in (32):

(32) [[cats]] = λx. x is a cat & ¬atom(x)

Which denotation, (31)b or (32), is chosen in a particular context is subject to the pragmatic principle of the Strongest Meaning Hypothesis, a principle which is not too dissimilar in spirit to the competition appealed to by the unambiguous accounts. Adopting (31) *and* (32) avoids, of course, the postulation of systems that dispense with [−atomic], and involves ambiguous plural forms. We will see more of the details of this solution in section 4.2.

3.2 Why [−atomic] cannot be dispensed with

In this section I provide an argument against the claim that [+atomic] can occur without [−atomic] in a given number system. The logic of the argument is as follows. If systems that dispense with [−atomic] are allowed in Harbour's theory, then a language that has inclusive plurals is one such system. The theory of number then predicts that such a language should not make use of [−atomic] elsewhere in the system: that is, it should not distinguish number values that make use of [−atomic], such as dual or paucal. However, this prediction is wrong, since languages with [−atomic]-based number values and inclusive plurals exist. I show here that Ljubljana Slovenian and Biak are examples of such languages.

Dual inflection is present on verbs, adjectives, cardinal numerals, nouns and various kinds of pronouns in Ljubljana Slovenian (Derganc 2003, Herrity 2015, Marušič and Žaucer to appear, Toporišič 2000)(recall section 2). Initial examples of the dual are as follows:

(33) *Ljubljana Slovenian*

Midva	rada	planinariva.
We.NOM.MASC.DU	willing.MASC.DU	hike.1DU

'The two of us like to hike'

(34) *Ljubljana Slovenian*

Na betonski	pingpong	mizi	sta	fanta
on concrete	ping-pong	table	AUX.DU	boy.NOM.MASC.DU
igrala	pingpong			
play.PTC.MASC.DU	ping-pong			

'(The) two boys played ping-pong on the concrete ping-pong table'

Example (33) shows a dual form of the 1st person pronoun in subject position, with agreeing elements in the dual. (34) shows a dual noun also in subject position, with the auxiliary and the verb in agreement. As shown in (34), dual number is compatible with both definite or indefinite interpretations.[15]

[15] More support seems needed from the context in order to fully license the indefinite interpretation in this case, e.g., an enumeration context in which the speaker is describing the people who were in the park earlier and what they were doing. Dvorak and Sauerland (2006) and Marušič and Žaucer (to appear) discuss this issue further, with Dvorak and Sauerland proposing that the dual is presuppositional—a

Importantly, Ljubljana Slovenian has inclusive plurals. This can be seen from the interpretation of plural forms in negative contexts ((35)-(37)), questions ((38)), the restriction of a universal quantifier ((39)), and the antecedent of a conditional ((40))—these are some of the canonical environments for the inclusive interpretation of plural forms (recall the English examples in section 3.1):[16]

(35) *Ljubljana Slovenian*

Do	danes	fantom	(še)	nisem	pomagal
until	today	boy.DAT.MASC.PL	(yet)	NEG.AUX.1SG	help.PTC.SG

'Until today I didn't help boys'

(36) *Ljubljana Slovenian*

Nimam otrok.
NEG.have.1SG child.GEN.MASC.DU/PL[17]
'I don't have children'

(37) *Ljubljana Slovenian*

Ne vidim konjev na travniku.
not see horse.GEN.MASC.DU/PL on meadow
'I didn't see horses in the meadow'

(38) *Ljubljana Slovenian*

A: Ali ima Peter otroke?
Q have Peter child.ACC.MASC.PL
'Does Peter have children?'

---

statement that is too strong, given the availability of indefinite, non-presuppositional interpretations in this and other examples in this paper.

[16] Given the amount of syncretism between dual and plural forms in the feminine and the neuter in Ljubljana Slovenian (see **Table 1**), most of the examples below use masculine nouns, where the dual is clearly different from the plural.

[17] In examples (36) and (37) the verbs involved require the Genitive of negation: even verbs that normally take Accusative objects must take Genitive ones in the context of negation. Since the dual and the plural are always syncretic in Genitive case (recall **Table 1**), it is not possible to tell which of the dual or plural form is being used there. Even then, (36) and (37) (cf. also (39)) are interpreted inclusively and are not ambiguous between an inclusive plural reading and a negated dual reading ('I don't have two children/horses'). For the latter, an overt numeral *two* (which takes nouns in the dual) is needed:

(i) *Ljubljana Slovenian*

Nimam dveh otrok.
NEG.have.1SG two.GEN.MASC children.GEN.MASC.DU
'I don't have exactly two children' (i.e., I have one, or three or more)

(ii) *Ljubljana Slovenian*

Ne vidim dveh konjev na travniku.
NEG see two.GEN.MASC horse.GEN.MASC.DU on meadow
'I didn't see (the) two horses in the meadow'

Dative doesn't change in negative contexts and here we do get negated dual readings (cf. (35)):

(iii) *Ljubljana Slovenian*

Do	danes	fantoma	nisem	pomagal
until	today	boy.DAT.MASC.DU	NEG.AUX.1SG	help.PTC.SG

'Until today I didn't help (the) two boys'

B: Ja. Ima enega
Yes has one
'Yes, he has one'

(39) *Ljubljana Slovenian*
Vsaka hiša ki ima okna s pogledom
every house.NOM.FEM.SG which has window.ACC.NEUT.DU/PL with view na
morje je precenjena
on sea is overpriced
'Every house which has windows with a view of the sea is overpriced'

(40) *Ljubljana Slovenian*
Kdor prvi zagleda konje na tem travniku, dobi
who first see horse.ACC.MASC.PL on this meadow wins
nagrado
prize
'Whoever first sees horses on this meadow wins a prize'

Example (35), with the plural form in a negative environment, contrasts with an example like (41), where the plural form is in an upward-entailing environment and is interpreted exclusively (the number of students that got run over is three or more). Example (39) contrasts with (42), where the plural form *okna* 'windows' is no longer in a downward-entailing environment and is interpreted exclusively (we are now considering a house with three or more windows):

(41) *Ljubljana Slovenian*
En avtomobil je povozil
One.NOM.MASC.SG car.NOM.MASC.SG AUX.SG ran.over.PTC.MASC.SG
študente
student.ACC.MASC.PL
'A car ran over students'

(42) *Ljubljana Slovenian*
Ena hiša ki ima okna s pogledom na
one house.NOM.FEM.SG which has window.ACC.NEUT.DU/PL with view on
morje je precenjena
sea is overpriced
'One house which has windows with a view of the sea is overpriced'

A proposal to deal with the inclusive plurals of Ljubljana Slovenian that does not use [−atomic] predicts that the number system of this language should not have a dual number value, since [−atomic] wouldn't be available and [−atomic] is a component of the dual. However, Ljubljana Slovenian is a singular-dual-plural system on nouns. In other words, if Harbour's theory is modified so as to allow languages with inclusive plurals to be [−atomic]-less systems, then the resulting theory predicts that languages with inclusive plurals should have no dual (or any other number value based on [−atomic]), contrary to fact. The number-neutral treatment of plural forms, so widely used in the formal semantics literature, is thus not a possible analysis under Harbour's theory.

This conclusion holds despite Dvorak and Sauerland's (2006) proposal of a [−atomic]-less analysis of Slovenian which does not make this prediction. In their approach, Slovenian plural forms are unambiguously number-neutral, that is, inclusive, as in Sauerland (2003). Singular and dual forms are analyzed as semantically contentful. In order to make the comparison with Harbour's system maximally transparent, I have adjusted Dvorak and Sauerland's proposal as in (43) (recall footnote 13):

(43) a. $[[cat_{sg}]] = \lambda x.$ x is a cat & atom(x)
b. $[[cat_{du}]] = \lambda x.$ x is a cat & ¬atom(x) & ¬∃y ¬atom(y) & y⊏x
c. $[[cat_{pl}]] = \lambda x.$ x is a cat

Dvorak and Sauerland posit three number features for Ljubljana Slovenian, [SINGULAR], [DUAL], and [PLURAL]. The semantics for [SINGULAR] in (43)a is just like the singular semantics assumed in Harbour for [+atomic] and in (31)a. (43)b is the semantics assumed for the [DUAL] feature. This semantics is stipulated for this feature, not compositionally derived. (43)c is the number-neutral semantics for [PLURAL] in (31)b. This analysis predicts that languages with a dual and with inclusive plurals can exist. However, the problem with this solution is that it stipulates the semantics of the dual as a primitive. A great loss of explanatory power follows: if [DUAL] is a primitive feature, nothing prevents [TRIAL], [PAUCAL], [GREATER PLURAL], [MINIMAL], etc. from being primitives as well. And in that case, nothing prevents any logically possible, but unattested, number system from being generated. Clearly, this is not a possible solution from the perspective of Harbour's theory, and is, thus, not adopted here.

It is also possible to make this argument with Biak, the Indonesian language discussed in section 2, with the caveat that the locus of the expression of number features is not on nouns in this language. In addition to demonstratives and determiners, Biak uses subject agreement verbal prefixes to express number distinctions. Examples (44) and (45) illustrate agreement with singular and plural bare subjects:

(44) *Biak*
Ikak (oso) d-arek i
snake one 3SG-bite PRON.3SG
'A snake bit him'

(45) *Biak*
Ikak s-arek i
snake 3PL.ANIM-bite PRON.3SG
'Snakes bit him' (at least four snakes)

Bare dual and paucal nouns cannot serve as subjects for independent reasons in Biak, but non-bare ones show the corresponding verbal agreement, as shown in (46) and (47):

(46) *Biak*

Ikak	*(suya)	su-arek	i
snake	DEF.3DU	3SG-bite	PRON.3SG

'The two snakes bit him'

(47) *Biak*

Ikak	*(skoya)	sko-arek	i
snake	DEF.3PAUC	3PAUC-bite	PRON.3SG

'The three/several snakes bit him'

In Harbour's terms, as we saw, Biak is a [±additive, ±minimal, ±atomic] system, with duals and paucals, that is, with number values built with [−atomic]. Yet, Biak has inclusive plurals, as argued for in Dalrymple and Mofu (2013). Consider the following examples:

(48) *Biak*

Ikak	(ono)	s-arek	i	ba
snake	INDEF	3PL.ANIM-bite	PRON.3SG	NEG

'Snakes did not bite him/no snakes bit him'

(49) *Biak*

Ikak	(ono)	s-arek	i	ke?
snake	INDEF	3PL.ANIM-bite	PRON.3SG	Q

'Did snakes bite him?'

Example (48), with sentential negation, is interpreted inclusively, and so is (49). A positive answer to (49) informs that one or more snakes bit him; with a negative one, no snakes did. Again, a solution to the inclusive plurals problem that assumes just an inclusive semantics for plural forms, coupled with Harbour's decompositional account of duals and paucals, predicts that Biak should not have inclusive plurals, contrary to fact. Thus, a solution to the problem of inclusive plurals that dispenses with [−atomic] altogether is not possible within Harbour's system, and an alternative to such an analysis is necessary[18].

4 The solution: general number and ambiguity of plural forms

I begin this section by discussing the category of general number, a number value attested in languages such as the Fouta Jalon dialect of Fula (a Niger-Congo language spoken in Guinea), as well as Bayso, discussed above. General number has the semantic import of number neutrality (Corbett 2000; see also Greenberg 1972 and Sanches 1973). I argue that languages with inclusive plurals are [±atomic] systems where plural forms spell out, in addition to [−atomic], general number. This is a minimal addition to Harbour's system, which remains otherwise intact: general number is a category already acknowledged by him for languages that have no grammatical number at all, and its treatment as the absence of NumP doesn't change anything about the other

[18] Harbour (2016: 149-152) briefly entertains a solution to the inclusive plurals problem that makes use of a function which, operating on sets of pluralities, accesses the atoms that constitute them. It is difficult to see how such a function could be justified independently—or why it would not be available in languages that don't have inclusive plurals.

assumptions that he makes. With this in place, I use Farkas and de Swart's (2010) Strongest Meaning Hypothesis, as well as Corbett's (2000: 12) proposal that general number is used when number is irrelevant, to explain the distribution of exclusive and inclusive plurals. I end the section by arguing against two other explanations for the phenomenon at hand.

4.1 General number

Corbett (2000:9-19, 2012: 224-33) proposes that Bayso and the Fouta Jalon dialect of Fula possess a category of general number in addition to other numbers. Both Bayso and Fouta Jalon Fula make a singular-plural distinction, with Bayso having, in addition, a paucal number value, as we saw in section 2. In both languages, singular and plural (and paucal) are expressed via dedicated suffixes and general number is expressed via bare stems. General number has the semantic import of number neutrality, as evidenced for Bayso in (50)a (Corbett 2000, 2012, Corbett and Hayward 1987, Hayward 1979) (recall (3)):

(50) *Bayso*
a. Lúban hudure
lion.GENERAL sleep.PAST.MASC.SG
'Lions/A lion slept'
b. Lubán-titi hudure
lion-SG sleep.PAST.MASC.SG
'A single/particular lion slept'
c. Luban-jaa hudureene
lion-PAUC sleep.PAST.PL
'A few lions slept'
d. Luban-jool hudure
lion-PL sleep.PAST.MASC.SG
'Lions slept'

The evidence for the existence of an independent category of general number goes beyond the number-neutral semantics of bare stems in (50)a. As Corbett (2012) shows, nouns in their general number form trigger specific patterns of verbal agreement that distinguish them from singular, paucal and plural nouns. In fact, there are eight agreement classes of nouns in Bayso according to their verbal agreement patterns when in the general number form and the plural form. For example, nouns that belong to the class of *lúban* 'lion' agree in masculine singular when in the general number and plural forms, as can be seen from (50)a and (50)d. Nouns that belong to a separate class that includes *kimbír* 'bird' agree with the verb in the feminine singular when in the general number form and in masculine singular when in the plural form. A third class that includes *baal* 'feather/leaf' agrees in masculine singular when in the general form, but in plural when in the plural form, and so on. The agreement patterns when the noun is in singular and paucal forms do not allow us to tease apart the classes, but those that occur with general number and plural forms do. Thus, a number category beyond singular-paucal-plural is necessary in Bayso. For Fouta Jalon Fula, we have the following (Corbett 2000:12 and Koval' 1979):

	GENERAL	SINGULAR	PLURAL
toad	toti	totii-ru	totii-ji
cat	nyaari	nyaarii-ru	nyaarii-ji
hen	gerto	gerto-gal	gertoo-ɗe
egg	boofo	woofoo-nde	boofoo-ɗe
bottle	biini	biinii-ri	biinii-ji

Table 4 Nouns in the Fouta Jalon dialect of Fula

Corbett observes that when the general number form of a noun is used, "number is irrelevant", as demonstrated in the following example:

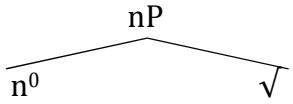
(51) *Fouta Jalon Fula*

Ko	biini	tun	waawi	marde	beere
PART	bottle.GENERAL	only	can.PERF	preserve	beer

'Only a bottle/bottles can preserve beer'

Languages with general number only exist, e.g., Pirahã (Everett 1986: 217, Corbett 2000: 50-1), or Dëne Sųłiné (Wilhelm 2008). Harbour's (2014) proposal for such languages, which I follow here, involves the necessary absence of NumP in the language[19]. Thus, no number features can appear in Num^0, which results in number-unmarked, number-neutral nouns, pronouns, etc. Even though general number in Bayso or Fouta Jalon Fula is not discussed explicitly by Harbour, the analysis for them is clear: both languages allow NumP to be absent, though they don't force it to be so. When NumP is not generated as part of the structure of NP, nouns are interpreted as number-neutral. Morphologically, the absence of NumP in Bayso, for example, is reflected in the absence of number morphology on general number forms and in the specific verbal agreement patterns it triggers. Thus, Bayso, is a [±additive, ±atomic] system with optional NumP. I then assume that the syntax of general number is as in (52):

(52)



No features operate in these circumstances on nP; further projection within the noun phrase is possible but will not include NumP. Semantically, general number forms are number-neutral, in the sense that the set denoted by nP contains both atomic and non-atomic individuals (recall (7), (8)). This is the syntax and semantics assigned to general number forms in Bayso and Fouta Jalon Fula. Regarding the morphology, Bayso and Fouta Jalon Fula use a separate, bare form for the expression of (52). The innovation in my proposal is rather simple: languages may make use of an already existing form to spell out (52). In particular, languages may use their plural forms to do so. In the languages that do this, plural forms are ambiguous: they either spell out NumP with (at least) the feature [−atomic] in Num^0 (recall (15), (16)c, (17)c), or they spell out nP as in (52)—this makes the projection of NumP optional in these languages. The distribution of the two types of denotation is, following Farkas and de Swart, regulated by (at least) the Strongest Meaning Hypothesis, explained in detail in the next subsection.

[19] Alternatively, one can assume that NumP is always generated, but that Num^0 in these languages is always empty. Nothing substantial seems to follow from one or the other implementation.

4.2 Ambiguity of plural forms

The proposal is, then, that plural forms are ambiguous. In Harbour's terms, that means that plural forms either introduce (at least) [−atomic], or spell out nP. Singular forms introduce (at least) [+atomic]. Thus, for English, we have:

(53) $[[cat_{sg}]] = [[+atomic]]([[nP]]) = \lambda x.\ cat(x) \& atom(x)$
$[[cats_{pl}]] = [[-atomic]]([[nP]]) = \lambda x.\ cat(x) \& \neg atom(x)$
$[[cats_{gn}]] = [[nP]]$

We now need an explanation for the distribution of the meanings associated with plural forms. Which one of the two meanings of *cats* is chosen in a given environment? Why are inclusive interpretations of plural forms attested in downward-entailing environments, but not in upward-entailing environments?

Let us notice, with Farkas and de Swart (2010), that N_{gn} and N_{pl} give rise to interpretations that are in asymmetric entailment relations. To see this, consider that if there is a member of $[[N_{pl}]]$ that snores, then it necessarily follows that there is a member of $[[N_{gn}]]$ that snores. If there is a member of $[[N_{gn}]]$ that snores, however, it doesn't necessarily follow that there is a member of $[[N_{pl}]]$ that snores—there could be an atomic individual snorer, which is not a member of $[[N_{pl}]]$. In these circumstances, and everything else being equal, the Strongest Meaning Hypothesis, a pragmatic principle, as formulated in Farkas and de Swart (2010: 27), applies:

(54) The Strongest Meaning Hypothesis: when an expression is assigned a set of interpretations ordered by entailment, choose the strongest element of this set that is compatible with the context

In upward-entailing contexts such as (19), repeated here, the proposition that Lina harvested two or more tomatoes (which arises as a result of $[[N_{pl}]]$) entails, and is thus stronger than, the proposition that Lina harvested one or more tomatoes (which arises as a result of $[[N_{gn}]]$):

(55) *English*
Lina harvested tomatoes

Thus, the Strongest Meaning Hypothesis dictates that the interpretation that arises from $[[N_{pl}]]$ is chosen for (55). In downward-entailing environments, such as negative contexts, antecedents of conditionals, or restrictions of universal quantifiers, entailment relations are reversed. For example, for the case of (20), repeated here, the proposition that Lina harvested neither one nor more tomatoes (which arises as a result of $[[N_{gn}]]$) entails and is thus stronger than the proposition that Lina didn't harvest two or more tomatoes (which arises as a result of $[[N_{pl}]]$):

(56) *English*
Lina didn't harvest tomatoes

As opposed to (55), it is the interpretation that arises as a result of $[[N_{gn}]]$, not $[[N_{pl}]]$, that is strongest in (56). The same reasoning applies to the other downward-entailing environments considered above (except questions, as per footnote 14). Thus, the result

is that inclusive plurals occur in downward-entailing environments and in questions, and exclusive plurals occur in upward-entailing environments, as desired.

As Farkas and de Swart observe, the Strongest Meaning Hypothesis is a pragmatic principle, formulated relative to a context. This means that it predicts that there are contexts in which the entailing proposition might not be chosen—as long as the entailed proposition is the strongest in that particular context. Indeed, as they show, the prediction is confirmed by examples such as (57) and (58) in English, where the plural forms *mice* and *children* are in upward-entailing environments but interpreted inclusively, or the similar Ljubljana Slovenian example in (59):

(57) *English*
[Speaker walks into basement, notices mouse droppings, has no way of telling how many mice there are]: Arghh, we have mice!

(58) *English*
[Speaker walks into unknown house, notices toys littering the floor, has no way of telling how many children there are in the house]:
There are children in this house

(59) *Ljubljana Slovenian*[20]
[Speaker walks into unknown house, notices toys littering the floor, has no way of telling how many children there are in the house]:

Poglej	vse te	igrače –v	hiši	so	otroci.	
look	all these	toys in	house.DAT.SG	AUX.PL	child.MASC.NOM.PL	

'Look at all these toys—there are children in the house'

The reason why these plural forms are interpreted inclusively is that, as dictated by the Strongest Meaning Hypothesis, the strongest meaning compatible with the knowledge state of the speaker is the inclusive meaning. In previous, upward-entailing examples, on the other hand, default assumptions were made about the context, such as, for example, that the speaker is knowledgeable.[21, 22]

[20] Speakers will hesitate in our earlier examples (41) and (42) and say that, e.g., it is possible for less than three students to have been run over in (41) if the example is interpreted "in a sort of generic way". I interpret this to mean that speakers try to find contexts where the general number plural would be felicitous, something which is done for them already in (59), as predicted by the account defended here.

[21] The proposal predicts that Biak examples such as (45) should be able to receive an inclusive interpretation in the right context, e.g., if the number of snakes that bit him is irrelevant. This prediction remains to be verified but, given that the range of the paucal seems to be between three and approximately ten, examples such as (45), which require at least four snakes to have bit him, suggest that inclusive plural interpretations are indeed possible in upward-entailing contexts in this language.

[22] It is harder to find examples in which the exclusive interpretation of plural forms is chosen in downward-entailing environments. Some obvious examples involve the use of metalinguistic negation:

(i) A teacher to her students: What did you do over the holidays?
Student 1: I read books
Student 2: I also read books
Student 3: I didn't read books, but I read a book

The interpretation of the plural form *books* by Student 3 is exclusive even if in a negative environment, as otherwise the continuation "…but I read a book" would not be felicitous. Contrastive focus might be needed on the *–s* suffix for some speakers. Consider also the following examples:

Notice that the Strongest Meaning Hypothesis does not apply in the case of the Bayso example in (50)a or the Fouta Jalon example in (51). Here the specific general number forms of the relevant nouns are used (*lúban*, *biini*). These forms are not ambiguous—they unambiguously spell out (52). Thus, there aren't two propositions to consider the strength of and there isn't a *single* expression that is assigned a set of interpretations. Corbett observes, regarding examples such as (51), that, in languages that have specific general number forms, these are used "when number is irrelevant". That is, speakers of these languages choose the most relevant proposition in the context: if number is irrelevant, there is no need to contribute propositions that inform about number. The principle at stake here is something like the Gricean maxim of relevance. The idea that contexts of number irrelevance favor the use of general number forms, however, suggests that, besides contexts of speaker ignorance, contexts of number irrelevance should also play a role when general number forms coincide with other forms (in the case of languages with inclusive plurals, plural forms). Indeed, this seems to be necessary. Consider the following example:

(60) *English*
[The speaker works for the town hall and is going around the neighbourhood distributing leaflets about childcare options. She is fully informed of the number of children residing in 82a and 82c Bethune Road; in fact, she is looking at the list with information extracted from the census and knows that one child resides in 82a, and three children reside in 82c]:
There are children in 82a. There are children in 82c. But there are no children in 82b

The plural form *children* is interpreted inclusively in the first sentence of (60), or else the fact that only one child resides in 82a should make the first sentence false. The speaker is fully informed of the exact number of children residing in each house, but what is important in the context is not the exact number of children, but whether there are any children at all residing at a particular address. As long as the number of children residing at an address is at least one, childcare leaflets are called for at that address. Thus, at least two principles, the Strongest Meaning Hypothesis and the Gricean maxim of relevance, regulate the distribution of general number and plural forms.[23, 24]

(ii) #If horses and donkeys are the parents of this animal, then it is a mule
(iii) If horses and donkeys are the grandparents of this animal, then it is a mule
(iv) If a horse and a donkey are the parents of this animal, then it is a mule

An inclusive interpretation cannot be at work in (ii) for *horses* and *donkeys* in the *if*-clause, for that would make the sentence well-formed, as can be seen from the well-formedness of (iii) (cf. also (iv), with singular nouns). Why only the exclusive interpretation is available in (iii) is a question that deserves further investigation.

[23] It might be possible to reduce these two principles to just one, but I don't explore that here. It is also possible that there are other reasons that force a choice between the inclusive and the exclusive interpretation, e.g., if there are grammatical principles that are sensitive to the presence of atoms. Pereltsvaig (2014) argues that Russian inclusive plurals (general number plurals in our analysis) are syntactically selected in a number of grammatical constructions.

[24] The proposal predicts that plural forms in Bayso are not ambiguous, and hence never give rise to inclusive plural interpretations, just like the plural forms of languages like Turkish, Armenian or Brazilian Portuguese, as described in section 3. This prediction remains to be verified.

Regarding the semantics of exclusive plurals now, recall from sections 2 and 3 that not all exclusive plurals are created equal. The proposal made in (53), repeated in (61), applies specifically to singular-plural languages with inclusive plurals:

(61) $[[N_{sg}]] = [[+atomic]]([[nP]])$
$[[N_{pl}]] =[[-atomic]]([[nP]])$
$[[N_{gn}]] = [[nP]]$

For a singular-dual-plural system with general number, such as Ljubljana Slovenian, the proposal is as in (62):

(62) $[[N_{sg}]] = [[+minimal]]\ ([[+atomic]]([[nP]]))$
$[[N_{du}]] = [[+minimal]]\ ([[-atomic]]([[nP]]))$
$[[N_{pl}]] = [[-minimal]]\ ([[-atomic]]([[nP]]))$
$[[N_{gn}]] = [[nP]]$

(63) is for a singular-paucal-plural system with general number such as Bayso:

(63) $[[N_{sg}]] = [[-additive]]\ ([[+atomic]]([[nP]]))$
$[[N_{pauc}]] = [[-additive]]\ ([[-atomic]]([[nP]]))$
$[[N_{pl}]] = [[+additive]]\ ([[-atomic]]([[nP]]))$
$[[N_{gn}]] = [[nP]]$

For Biak, it is as in (64):

(64) $[[N_{sg}]] = [[-additive]]\ ([[+minimal]]([[+atomic]]([[nP]])))$
$[[N_{du}]] = [[-additive]]\ ([[+minimal]]([[-atomic]]([[nP]])))$
$[[N_{pauc}]] = [[-additive]]\ ([[-minimal]]([[-atomic]]([[nP]])))$
$[[N_{pl}]] = [[+additive]]\ ([[-minimal]]([[-atomic]]([[nP]])))$
$[[N_{gn}]] = [[nP]]$

Exclusive plurals in these different systems have different semantic import. Table 5 summarizes the differences:

NUMBER VALUES OF SYSTEM	FEATURES OF THE NUMBER SYSTEM	EXCLUSIVE PLURAL FEATURES	PREDICTED LOWER BOUND OF EXCLUSIVE PLURAL	EXAMPLE LANGUAGE
singular, plural	[±atomic]	[−atomic]	2	English
singular, dual, plural	[±minimal, ±atomic]	[−minimal, −atomic]	3	Ljubljana Slovenian
singular, paucal, plural	[±additive, ±atomic]	[+additive, −atomic]	>2	Bayso
singular, dual, paucal, plural	[±additive, ±minimal, ±atomic]	[+additive, −minimal, −atomic]	>3	Biak

Table 5 Exclusive plurals in different number systems

In [±atomic] systems, the lower bound of the exclusive plural is correctly predicted to start at two. In [±minimal, ±atomic] systems such as Ljubljana Slovenian, the lower bound is predicted to start at three, something which was shown to be the case in

section 3.2. Where the lower bound of the exclusive plurals of systems that use the feature [±additive] is depends on where the conventional cut for this feature falls. As we saw earlier, the range of the paucal in Bayso goes from two to about six, which entails that the cut of [−additive] falls somewhere around the layer of the plural individuals constituted of six atoms, speaking informally. We have no information regarding the lower bound of the exclusive plurals of Bayso, as the range of its plurals is not discussed in the available literature. However, let us consider the possibility that the cut for [+additive] is conventionally set low in this language, somewhere around the cut for [−additive]. This would predict that speakers should find it possible to use both paucal and plural forms in contexts in which the number of real-world entities is approximately six. Suppose, on the other hand, that the cut for [+additive] is conventionally set slightly higher, so as not to coincide with the paucal. In that case, there will not be contexts in which both paucal and plural forms can be used. Dalrymple and Mofu (2013) show that the lower bound of the Biak exclusive plural is greater than three (recall example (45)). In Harbour's system, the reason for this is as follows: all features, including [±additive], yield, speaking in terms of sets, *proper subsets* of their input sets—recall (11). The input set for [+additive] in this case is delivered by the feature combination [−minimal, −atomic]— a set of plural individuals constituted of at least three atoms. A proper subset of that cannot contain individuals constituted of three atoms or less (recall also footnote 11).

Note that adding a category of general number for nouns in a language like English raises the question of how subject-verb agreement works with these different number specifications. The answer is straightforward, however: plural agreement is the elsewhere case. Thus, singular subjects agree in the singular, and everything else (plural subjects, general number subjects) agrees in the plural.

Let us finish this section by considering the similarities and differences between this proposal and the two it is closest to. There is no difference between the proposal here and Farkas and de Swart's with regards to the existence of ambiguous forms or with regards to the use of the Strongest Meaning Hypothesis. However, there is a difference in terms of cost: that an inclusive interpretation for plural forms exists is justified independently on the basis of the category of general number in Bayso or Fouta Jalon Fula. This means that the claim that there are forms in languages that have the syntax in (52), with associated semantics, comes for free in my proposal. I do stipulate that those forms can be forms that already exist in the language in question, e.g., plural forms. In Farkas and de Swart's account, on the other hand, that there are forms in languages that have inclusive semantics *and* that those forms are plural forms are both stipulated statements. Another difference concerns the semantics for singular forms: Farkas and de Swart assume that they also have a number-neutral semantics, but I assume that, at least in English, Ljubljana Slovenian, and others, singular forms contribute [+atomic], as per Harbour. Finally, as shown in Table 5, the semantics for exclusive plurals is more sophisticated than assumed by Farkas and de Swart. From the perspective of Harbour's theory, all that the current proposal does is add the stipulation that plural forms can spell out general number—everything else follows. This makes the proposal maximally economical.

If the proposal defended here is correct, the spell out of general number with plural forms is a possibility widely attested in the languages of the world, as any language with inclusive plurals would have general number plurals, even though this

possibility is not contemplated by Corbett (2000).[25]

4.3 Arguments against yet other analyses

I would like to briefly consider two additional alternatives to the general number proposal of sections 4.1 and 4.2 before turning our attention to facultative number plurals. As opposed to the Sauerland-style alternative considered above, the two possibilities discussed here are in fact compatible with Harbour's theory—but they are still alternatives to the general number proposal (see Cabredo Hofherr, to appear, for further discussion of these alternatives). The first alternative is that inclusive plurals are (pseudo-)incorporated nominals. The second alternative is that their inclusive semantics are kind or generic interpretations, as argued for in Grimm (2012).

Let's begin with incorporation. While it is not possible to do justice here to the vast amount of literature on this topic (to begin, see Baker 1988 and Mithun 1984, 1986; for overviews with a focus on the semantics of incorporation, see Carlson 2006 and Dayal 2015), it is important to note that number neutrality is one of the hallmarks of incorporation—this is what makes it a possibility worthwhile considering here. The morpho-syntactic phenomenon of incorporation in West Greenlandic/Kalaallisut, an Inuit language spoken in Greenland and Denmark and discussed in van Geenhoven (1998: 13, 15), is illustrated in (66):

(65) *West Greenlandic/Kalaallisut*
Angunguu-p aalisagaq neri-v-a-a
Angunguu-ERG fish.ABS eat-INDIC-TRANS-3SG.3SG
'Angunguaq ate the/a particular fish'

(66) *West Greenlandic/Kalaallisut*
Arnajaraq eqalut-tur-p-u-q
Arnajaraq.ABS salmon-eat-INDIC-INTRAN-3SG
'Arnajaraq ate salmon' (lit. Arnajaraq salmon-ate)

Kalaallisut is an ergative-absolutive language with (in)transitive morphology on the verb, and with both subject and object agreement. (65) is a regular sentence without incorporation: the direct object *aalisagaq* 'fish' behaves like a regular syntactic object and has absolutive case, the verb is marked as transitive, and there is 3rd person singular object agreement on it. In (66), on the other hand, the notional object, *eqalut* 'salmon', has undergone a process similar to English compounding. It does not behave like a regular syntactic object any more: e.g., it does not trigger object agreement, it does not bear Case, and the verb is marked with intransitive morphology. *Eqalut* is an incorporated object in this sentence; (66), as opposed to (65), is compatible with the agent having eaten any amount of salmon/fish. A related process of pseudo-

[25] Pereltsvaig (2014) and Martí (2017) argue that inclusive plurals and inclusive singulars are two sides of the same phenomenon. The proposal defended here predicts that there should be languages which choose a form different from the plural to spell out general number. Martí (2017) argues that, despite appearances, Turkish is not a case in point. Brazilian Portuguese might be such a language, at least if Ferreira (2010) is right. Brazilian Portuguese would be a language with unambiguously exclusive plural forms (see (30)) and with ambiguous singular forms. This possibility, however, needs to be further evaluated within the context of the rich literature that exists on the topic of bare noun semantics in Brazilian Portuguese, to which I cannot to justice here (see, among others, Cyrino and Espinal 2015, Müller 2002, Pires de Oliveira and Rothstein 2011, Schmidt and Munn 2005).

incorporation is proposed by Dayal (2011), Farkas and de Swart (2003) and Massam (2001) for languages, such as Hindi, Hungarian or the Polynesian language Niuean, respectively, which display a slightly less tight relationship between the object and the verb. Pseudo-incorporated nouns may allow material to intervene between them and the verb, or may bear Case or number morphology.

The semantic contribution of incorporation as exemplified in Kalaallisut was hypothesized by van Geenhoven (1998) to involve a corresponding rule of interpretation where the verb introduces existential quantification over its property-denoting, notional object. Since nouns are assumed to contain both atoms and non-atoms in their denotation, number neutrality results. Van Geenhoven (2000) and McNally (2004) extend the use of semantic incorporation for the bare plurals of English and Spanish, respectively, explicitly hypothesizing that application of the rule of semantic incorporation need not be accompanied by the morpho-syntactic process of (pseudo-)incorporation.

The question for us is whether an analysis in terms of semantic incorporation is feasible for inclusive plurals in a language like English. If it were, then appealing to general number, as I've done above, would be unnecessary. Such an analysis would say, for languages like English, that plural forms undergo semantic incorporation obligatorily in downward-entailing contexts (and questions) and optionally in upward-entailing contexts (since we do sometimes find inclusive plurals in such environments, as discussed in section 4.2). Singular forms would not be subject to this rule at all (given, e.g., **I have child*). The main problem with this proposal is that it does not seem to constitute a real solution to the problem of inclusive plurals: the rule of semantic incorporation does not *per se* introduce number neutrality. The number neutrality of semantic incorporation follows from assumptions about the semantics of the *nouns* that undergo the process. This means that we still have to make a separate assumption regarding the inclusive semantics for English plural forms in downward-entailing contexts and questions (optionally in upward-entailing contexts), and we still also have to assume an exclusive semantics for them for upward-entailing contexts. In fact, in languages whose plural forms undergo pseudo-incorporation, such as Hindi or Hungarian, these forms are interpreted exclusively, not inclusively—so English plural forms in downward-entailing environments and questions would have to constitute an exception, thus removing most of the motivation for pursuing this line of analysis to being with. Furthermore, in languages that incorporate plural forms, such as, again, Hungarian or Hindi, singular forms also incorporate (Farkas and de Swart 2003: 110: "There is […] no language where bare plurals may incorporate but bare singulars may not"). This would make English rather odd.[26] Finally, the question arises as to why semantic incorporation would apply only in downward-entailing contexts and questions in the default case. In (pseudo-)incorporating languages, number neutral readings due to semantic incorporation are straightforwardly available in default upward-entailing contexts: why would it then not be the case in English?[27, 28]

[26] Subjects would also have to semantically incorporate in English, given examples such as (21)b. There are languages whose subjects incorporate (e.g., Chuckchee, Polinsky 1990), however, so this may not a problem for this analysis.

[27] English has been argued to have syntactically restricted versions of incorporation (e.g., for weak definites in Carlson and Sussman 2005, Carlson 2006 or Aguilar-Guevara and Zwarts 2011; for implicit indefinite objects in Martí 2015)—but these wouldn't apply to plural forms. Other languages, such as Catalan and Spanish, have been argued to have pseudo-incorporation of bare singulars in a very restricted set of contexts (e.g., *Tengo piso*, lit. 'I have flat') by Espinal (2010). This is entirely compatible with the postulation of general number, but does not explain the data we are after.

Moving on to the second alternative, the question is whether inclusive interpretations of plurals may have kind or generic interpretations (Carlson 1977, Krifka 1995, Chierchia 1998b) as their source. Starting with the kind DOG, for example, we could derive the set of instantiations of the kind DOG as the denotation of the plural form *dogs*. This would lead to a number-neutral, inclusive interpretation, since both atomic and non-atomic dog individuals count as instantiations of the kind DOG. An additional exclusive interpretation would account for exclusive readings. A proposal along these lines is defended by Grimm (2012), who observes that the distribution of inclusive and exclusive interpretations may be sensitive to the episodic-generic distinction. He considers examples such as the following, tested in an experimental setting:

(67) *English*
[Subject is shown picture of a woman:]
Is the woman in this picture holding mugs?

(68) *English*
[Subject is told about a rules-and-regulations context about employees in a corporation:]
Did the employee's team terminate projects this fiscal quarter?

Example (67) exemplifies an episodic context, and (68) is intended to favor a generic or kind interpretation. In (67), responses were positive 92% of the time if the woman in the picture was holding multiple mugs, and only 32% of the time if she was holding a single mug (this difference was statistically significant). In (68), responses were positive 99% of the time if the context made clear that the employee's team finished multiple projects, and 78% of the time if it was only one project. Notice that both (67) and (68) are questions, so, according to what we've said before, only an inclusive interpretation should be available. Grimm argues that this is the case only for contexts that favor generic interpretations, such as (68), but not (or not always) in episodic, spatio-temporally bounded contexts like (67). Plural forms in his account are ambiguous between a generic/kind denotation and an exclusive plural interpretation, and the distribution of readings is subject to the generic/kind nature of the context. Putting aside questions such as why 32% of responses are still positive in (67) when the woman in the picture is holding a single mug (that is, why *mugs* (67) gets an inclusive interpretation 32% of the time when the context should favor an exclusive one), or whether this result generalizes to environments beyond questions, there are at least two problems with this type of proposal. One is that, as already observed by Carlson (1977), bare plurals like *parts of this machine* never denote kinds and are always existential, as shown in (69), yet inclusive readings are possible for them (Chierchia 1998b: 373, van Geenhoven 2000: 234), as shown in (70):

(69) *English*
?? Parts of this machine are widespread

[28] Dayal (2011, 2015) argues that Hindi singular forms that pseudo-incorporate give rise to number-neutral interpretations in atelic or habitual interpretations, but not in telic ones. She defends an analysis where atelicity—and not nominal number—enables number neutrality. Atelicity is not an interfering factor in the examples we have considered here, as can be seen, e.g., in the telic examples in (20), (22) or (25) for English, or (35) and (37) for Slovenian, all of which are examples of inclusive plurals.

(70) *English*
John didn't see parts of this machine

Whether (70) allows a wide scope reading ("there are parts of this machine such that John didn't see them") in addition to a narrow scope reading ("it is not the case that John saw any parts of this machine") is debatable (van Geenhoven 2000 argues that the supposed wide scope reading is not a true wide scope reading), but this issue is orthogonal to our purposes: it is clear that the example has a narrow scope reading, and the narrow scope reading is an inclusive reading. Generic or kind interpretations cannot be the source of all inclusive plurals, and so something else is needed—the general number account of *parts*, I claim.

A second problem for this proposal is that a kind/generic analysis of inclusive readings is not an option for languages where nouns cannot denote kinds by themselves (Spanish, Italian, Hungarian, or Arabic and dialects, even though these languages allow bare nouns in argument position, to different degrees)(see Doron 2003, Dobrovie-Sorin, Bleam and Espinal 2006 and references cited there). Consider, for example, Spanish, as in the following examples (Laca 1996: 262, McNally 2004: 118):

(71) *Spanish*
a. En la India se están extinguiendo los tigres
in the India SE are extinguishing the tiger.PL
'Tigers are becoming extinct in India'
b. *En la India se están extinguiendo tigres
in the India SE are extinguishing tiger.PL

The examples in (71) show that bare plural forms cannot denote kinds in Spanish: the subject of the predicate *extinguirse* 'to become extinct' must be kind-denoting, and (71)b is ungrammatical (note that bare plural subjects are normally allowed in this language when in postverbal position, as in (73)). (71)a, where the plural form is accompanied by the definite article, is, on the other hand, grammatical. Thus, plural forms in Spanish need the definite article in order to serve as kinds. By themselves, they cannot produce a kind denotation. Yet, Spanish has bare inclusive plurals, as shown in the downward-entailing example in (72) (Laca 1996: 262, Martí 2008, McNally 2004: 118):

(72) *Spanish*
A la reunión no asistieron profesores
to the meeting not attended professor.PL
'The meeting was not attended by any professors'

In the upward-entailing version of (72), in (73), an exclusive interpretation is the default one, as expected:

(73) *Spanish*
A la reunión asistieron profesores
to the meeting attended professor.PL
'The meeting was attended by professors'

Thus, a kind/generic source for inclusive plurals is altogether unavailable in some languages, and yet these languages may have inclusive plurals. Again, an alternative source of inclusive readings is necessary—indeed, that's the general number account proposed here.[29]

5 General number and facultative number plurals

Facultative number, as discussed in Corbett (2000: 42-50, 93-4) (see also Greenberg 1966: 28), arises in number systems where a particular grammatical number value is optional. The language may, for example, be a singular-dual-plural system with facultative dual, in which case the dual need not be used in every circumstance that licenses its use. What will be important below is that, systematically, plural forms are the forms that are used instead of facultative number value(s). I argue here that this is because the general number semantics defended in section 4 for plural forms is such that their range includes the value of facultative number values. Thus, I argue, facultative number plurals are general number plurals.

Some words of caution are in order before we proceed. My goal here is <u>not</u> to present an analysis of facultative number. I don't have anything to say regarding why languages choose to mark certain number values as optional, or the details of how this is achieved. All that the proposal below is concerned with is the semantics of plural forms that replace facultative number values. Bear in mind also that a given number value need not be facultative in all languages. For example, dual forms are not facultative in all languages—in Sanskrit or Classical Arabic, it is obligatory whenever its conditions of use are met, and plural forms cannot be used in such circumstances (see Corbett 2000: 43, Diver 1987: 103, and MacDonell 1927: 180 for Sanskrit, and Blanc 1970: 42-3 for Classical Arabic)[30]. Also, other numbers, such as trial or paucal, can be facultative (for more details, see Corbett 2000: 42-50).

Let's begin by considering the case of a [±minimal, ±atomic] system that has, in addition, general number plurals. That is, consider the system in (62), repeated here, with both N_{pl} and N_{gn} spelled out via plural forms:

(74) $[[N_{sg}]] = [[+\text{minimal}]]\ ([[+\text{atomic}]]([[nP]]))$
$[[N_{du}]] = [[+\text{minimal}]]\ ([[-\text{atomic}]]([[nP]]))$
$[[N_{pl}]] = [[-\text{minimal}]]\ ([[-\text{atomic}]]([[nP]]))$
$[[N_{gn}]] = [[nP]]$

In languages with such number systems and where the dual is facultative, N_{gn} is predicted to be able to stand in for N_{du}. That is because, as argued for in section 4, the semantics of N_{gn} is number-neutral: the set denoted by nP includes, in addition to the atoms that proved so useful in the account of inclusive plurals in section 4, non-atomic

[29] To be more precise, the general number account proposed in sections 4.1 and 4.3 is the correct account of the facts if it can be shown to extend to cases such as (67) and (68). Putting aside the fact that no known account can explain why questions seem to favor inclusive readings, this is not difficult to do in the general number account. Consider, for example, the fact, established by Corbett, that general number is favored when number is irrelevant. We can reason about (67) as follows. Most people interpret the situation in (67) as one where number is, in fact, relevant: thus, the plural form *mugs* tends to get an exclusive interpretation in that context. Still, speakers sometimes entertain a context for (67) in which number is irrelevant, and hence provide their answer on the basis of an inclusive interpretation of the plural form. As for (68), we simply assume that generic contexts favor number irrelevance. An inclusive interpretation then ensues.

[30] It is not typologically uncommon for the dual to be facultative (Plank 1995: 134).

individuals constituted of any number of atoms, including, in particular, non-atomic individuals each of which is constituted of exactly two atoms. Now, if general number is spelled out via plural forms, plural forms in such a system are predicted to be able to replace N_{du}. Notice that, once we assume that exclusive plural forms have the [−minimal, −atomic] semantics in (74), we predict that N_{pl} cannot be what stands in for the dual, as N_{pl} is compatible only with three or more real world-entities. Facultative number plurals can thus be subsumed under general number plurals.

Indeed, Ljubljana Slovenian and Biak are able to use their plural forms to stand in for dual (or paucal) forms in certain circumstances, as predicted. In Ljubljana Slovenian, dual forms of nouns, as described in sections 2 and 3, are not always obligatory: plural forms can be used instead. A clear example of this is provided in (75) and (76); example (76) does not attribute more than two parents to the speaker (from Derganc 2003 and Marušič and Žaucer to appear; see also Corbett 2000: 43, Dvorak and Sauerland 2006, Priestly 1993: 440;):[31]

(75) *Ljubljana Slovenian*

Starša	sta	me	obiskala
parent.DU	aux.DU	me	visited.DU

'My parents visited me'

(76) *Ljubljana Slovenian*

Starši	so	me	obiskali
parent.PL	aux.PL	me	visited.PL

'My parents visited me'

Plural forms are the ones that replace facultative number forms in Ljubljana Slovenian. While there is more to say about the use of the dual in this language, what is important for our purposes is that the semantics of plural forms in this language has to be such that it must be compatible with exactly two real-world entities if we are to explain why it can be used instead of the dual. The proposal that N_{gn} associates with plural forms in Ljubljana Slovenian, as in (74), indeed captures this fact.[32]

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[31] While Toporišič *et al*. (2001) consider (75) substandard, Marušič and Žaucer (to appear) found it "abundantly attested in contemporary written standard Slovenian as it appears in newspapers and magazines". The noun *dvojčke* 'twins' behaves similarly.

[32] The status of the dual as facultative number in this language, as argued for in Corbett (2000), is actually not uncontroversial. Whereas with nouns as such as *starša* 'parents', both the dual and the plural are possible in contemporary usage, as in (75) and (76), with certain pair nouns with a natural pair interpretation there is actually a constraint against the use of the dual. Example (i) is the default way of expressing the proposition that Peter's own ears are big (see Dvorak and Sauerland 2006 and Marušič and Žaucer, to appear for more examples):

(i) *Ljubljana Slovenian*

Peter	ima	velika	ušesa
Peter	have.3SG	big.ACC.NEUT.PL	ear.ACC.NEUT.PL

'Peter has big ears'

If the dual form is used instead of the plural, as in (ii), the implication is that the two ears do not form a natural pair. For example, this could be in a context in which puppet ears are being assigned to people to wash:

(ii) *Ljubljana Slovenian*

Peter	ima	veliki	ušesi

Dalrymple and Mofu (2013) show that, in certain Biak possessive constructions, the plural can act as a facultative number plural for both dual and paucal. Consider first (77), which shows the noun *bukor* 'head' appearing in the alienable possession construction with a singular possessor and with singular agreement with *bukor*:

(77) *Biak*
Bukor bye-di
Head 3SG.POSS-DET.SG
'His head'

(78) shows that dual agreement with *bukor* is also possible:

(78) *Biak*
Bukor su-be-suya
Head 3DU.POSS-DET.DU
'Their (dual) heads' (two possessors)

Both with dual and paucal possessors, plural agreement with the noun is also possible:

(79) *Biak*
Bukor su-be-na
Head 3DU.POSS-DET.PL.ANIM
'Their (dual) heads' (two possessors)

(80) *Biak*
Bukor sko-be-na
Head 3PAUC.POSS-DET.PL.ANIM
'Their (paucal) heads' (a few possessors)

This suggests that both dual and paucal are facultative in this construction in Biak, and that plural forms (here, plural agreement with nouns) can be facultative number plurals.[33]

Matters are as follows concerning Bayso, that is, a system like that in (63), repeated here:

(81) $[[N_{sg}]] = [[-\text{additive}]]\,([[+\text{atomic}]]([[nP]]))$

Peter have.3SG big.ACC.NEUT.DU ear.ACC.NEUT.DU
'Peter has (two) big ears'

Dvorak and Sauerland's (2006) account of the dual in Slovenian builds this constraint into the semantic contribution of their [DUAL] feature, making it presuppositional. I don't fully see how a presuppositional semantics of the dual can explain the interpretation of an example such as (ii), as well as why in (i) the understanding is that it is Peter's own ears that are big, but, be that as it may, there are other problems with Dvorak and Sauerland's analysis. One we already saw in section 3: the feature [DUAL] is stipulated as a primitive in their account. Also, Plank (1995: 126) argues that it is cross-linguistically very rare for a language not to be able to use the dual with paired body part nouns like *ears*. This suggests that this restriction should not be built in as part of the basic contribution of the dual.

[33] Lack of further data prevents me from establishing whether or not facultative number is circumscribed to possessive constructions in Biak, but considerations in footnote 21 suggest that it probably is not.

$[[N_{pauc}]] = [[-additive]]\ ([[-atomic]]([[nP]]))$
$[[N_{pl}]] = [[+additive]]\ ([[-atomic]]([[nP]]))$
$[[N_{gn}]] = [[nP]]$

Bayso is not discussed in the available references as a language with facultative number, but such a characterization falls neatly within the realm of the current proposal. That is, given that Bayso has a general number form, as discussed in section 4, we can view the number distinctions that it does make elsewhere as optional. Returning to the data in (3) and (50), repeated here, I propose that the proper description of Bayso is that (82)b-d are examples of the use of singular, paucal and plural, respectively, and that (82)a is an example of the use of the general number form, which is also a facultative number form. Since $N_{gn} \neq N_{pl}$, plural forms in Bayso are not able to perform this function:[34]

(82) *Bayso*
a. Lúban hudure
lion.GEN sleep.PAST.MASC.SG
'Lions/A lion slept'
b. Lubán-titi hudure
lion-SG sleep.PAST.MASC.SG
'A single/particular lion slept'
c. Luban-jaa hudureene
lion-PAUCAL sleep.PAST.PL
'A few lions slept'
d. Luban-jool hudure
lion-PL sleep.PAST.MASC.SG
'Lions slept'

A consequence of this analysis is that singular number and exclusive plural number can also be facultative number values. These possibilities are not recognized in Corbett (2000), but there is no reason in the current system not to do so. Returning then to the case of English or Spanish, if the findings in this section are on the right track, English, Spanish, and other singular-plural systems with inclusive plurals are [±atomic] systems with general number and with the singular and exclusive plural values of nouns marked by the grammar as facultative.[35, 36, 37]

[34] With one potential exception. We saw in section 4.2 that the range of the paucal in Bayso goes from two to about six. The cut for [−additive], involved in deriving the paucal (see (81)) is thus set to be relatively low. If then the cut for [+additive], involved in deriving its (exclusive) plurals, were also set to be relatively low, the current system would predict that speakers should find it possible to use both paucal and plural forms in contexts in which the number of real-world entities is approximately six. On the other hand, if the cut for [+additive] is conventionally set slightly higher, so as not to coincide with the paucal, there will not be contexts in which both the paucal and the plural form can be used. What this discussion suggests is that, even in a language with specific general forms like Bayso, there might be exclusive plural forms that are sometimes used as facultative number forms—in this particular case, in a subset of the cases that license the use of the paucal. So, some exclusive plurals might also be facultative number plurals. This possibility remains to be explored in future research.

[35] Consider the fact that the context described in example (60) licenses the use of singular number when reference is made to 82a Bethune Road, as only one child lives there. In fact, the speaker may decide in such a context to provide more information than is required and felicitously use a singular form (in which case, as predicted, the following plural form is interpreted exclusively):

6 Conclusion

In this paper I have argued that, if one is to maintain Harbour's (2014) theory of grammatical number, the solution to the inclusive plurals problem cannot involve unambiguously number-neutral plural forms. The argument was based on languages that distinguish dual/paucal number on nouns, duals/paucals being derived by means of the feature [−atomic] in Harbour's system. For such languages, doing away with [−atomic] to deal with the inclusive plurals problem automatically entails the lack of the dual or the paucal, and the prediction is that languages with both duals/paucals and inclusive plurals should not exist, contrary to fact.

The alternative solution proposed here shares with Farkas and de Swart's (2010) proposal that plural forms in languages with inclusive plurals are ambiguous between an inclusive, number-neutral denotation, and an exclusive, strictly plural denotation. It also shares with it the postulation of the Strongest Meaning Hypothesis as (one of) the principles that regulate the choice between the inclusive and the exclusive semantics of plural forms. However, the account subsumes inclusive readings under the category of general number, and stipulates that, just as there are languages whose general number forms are unique, there are also languages whose general number forms are, in fact, its plural forms. Ambiguity is less costly in this proposal because the semantics for plural forms that is necessary to account for inclusive readings is justified independently. General number was implemented as the absence of NumP in the syntax of noun phrases, something that Harbour already uses to deal with languages that have no

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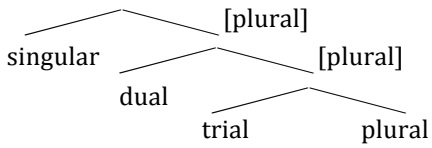
(i) *English*
[The speaker works for the town hall and is going around the neighbourhood distributing leaflets about childcare options. She is fully informed of the number of children residing in 82a and 82c Bethune Road; in fact, she is looking at the list with information extracted from the census and knows that one child resides in 82a, and three children reside in 82c]:
There is one child in 82a. There are children in 82c Bethune Road. But there are no children in 82b

Given (60) and (i), singular number in English can be seen as facultative.

[36] Corbett (2000: 48) distinguishes facultative number from general number, stating that "facultative number is found where marking of number is required, but not all number distinctions are obligatory. […] In Bayso the choice is to mark number or not, and within number the appropriate value is selected". But, empirically, there is no way to tell apart a language where marking of number is required, but not all number distinctions are obligatory, from one whose number system includes general number in addition to other number values.

[37] Corbett (2000) stipulates a hierarchy of facultative number values as follows (for a language with a singular-dual-trial-plural system):

(i)


If a language with a singular-dual-trial-plural system has facultative number, then it must involve, at least, the bottommost node in the hierarchy in (i). If it involves only the bottommost node, the language will have facultative trials that can be replaced by plural forms. If it involves one further node up, then the language will have facultative duals and trials that can be replaced by plural forms, and so on. This proposal is intended to account for both the marking of number values as facultative and the use of plural forms to stand in for number values so marked. Even then, the hierarchy is applicable only in languages whose plurals have number-neutral semantics to begin with, or else those plural forms would not be able to stand in for other number values. Thus, the proposal made in this section regarding facultative number can be seen as complementary to Corbett's proposal in (i).

number. In languages with inclusive plurals, plural forms have a second, NumP-based, [−atomic]-based denotation that is entirely compatible with Harbour's system and that generates a suitable exclusive semantics for them. I showed that the choice of general number plurals is also governed in part by number irrelevance, which has been argued by Corbett (2000) to be the hallmark of general number. From the perspective of Harbour's system, all that the current proposal needs is the statement that plural forms can spell out general number, and no extra machinery needs to be added to the theory. The general number solution was then extended to account for facultative number plurals.

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