I argue that an account of both inclusive plurals and the crosslinguistic typology of grammatical number requires postulating a [–atomic] feature (or something very much like it) in the structure of exclusive-plural DPs. When combined with the only theory we currently have that accounts for the crosslinguistic typology of number (Harbour 2014), theories in which the exclusive-plural DPs of a language with inclusive plurals are [–atomic]-less under- or overgenerate with respect to that typology. These problems disappear as soon as the structure of exclusive plural DPs contains a component that generates exclusive-plural interpretations, either Harbour’s [–atomic] feature (added to a system with a second, [–atomic]-less structure, a proposal compatible with, e.g., Farkas and de Swart 2010) or a predicate-level exhaustivity operator (from Mayr 2015).

Keywords: grammatical number, inclusive plurals, dual, paucal, typology of number

1 Introduction: Semantics of Plural Count Nouns

The problem of inclusive plurals is illustrated in (1)–(2): plural forms of nouns in English, such as tomatoes, introduce into the interpretation1 only pluralities (or plural or nonatomic individuals2) in examples such as (1),3 but both singularities (or singular or atomic individuals) and pluralities in examples such as (2).

(1) English
   Lina harvested tomatoes.
   (Sauerland 2003:269, (38a))

This work would have been literally impossible without the great generosity of a number of people. I want to thank, in particular, the tireless linguists who have shared their knowledge of (Ljubljana) Slovenian and/or their judgments with me: Lanko Marušič, Tatjana Marvin, Milena Sheppard, and Rok Začer. For their help, their many questions, and their comments, which have greatly improved my argument, thanks also to Klaus Abels, Hagit Borer, Greville Corbett, Mary Dalrymple, Gabi Danon, Silvia Gumiel Molina, Daniel Harbour, Clemens Mayr, Bruce Morén-Duolljá, Isabel Pérez Jiménez, Marisa Rivero, Jacopo Romoli, Christina Sevdali, Yasu Sudo, several anonymous reviewers, and audiences at the 27th Colloquium on Generative Grammar in Alcalá de Henares (Spain), Ulster University at Jordanstown in Belfast (UK), and the Syntax and Semantics Reading Group at Queen Mary University of London. All errors are of course mine.

1 I use the term interpretation in the broadest possible sense, without making a commitment as to what mechanisms (syntactic, pragmatic, semantic) are involved in generating it.
2 See Link 1983 and much subsequent work.
3 At the very least when the example is interpreted purely episodically, not generically. The issue of genericity and kind interpretations is briefly taken up in section 4.1.
Lina didn’t harvest tomatoes.

(Sauerland 2003:269, (41b))

For (1) to be true, Lina must have harvested at least two tomatoes and is thus concerned with tomato pluralities each of which is constituted of two or more tomato atoms. However, the negation of this sentence, in (2), requires Lina not to have harvested any tomatoes at all—neither one (a singularity) nor more than one (a plurality). If the plural form *tomatoes* in (2) introduced pluralities only, the sentence would 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 include both singular and plural individuals. Exclusive plurals are plural forms that introduce only plural individuals. The issue is, What is the denotation of plural noun forms? Are plural forms always inclusive semantically? Are they ambiguous between an inclusive and an exclusive semantics? These questions, their answers, and their consequences have received considerable attention in the literature (see Dvorak and Sauerland 2006, Farkas and de Swart 2010, Grimm 2012, Ivlieva 2013, Krifka 1989, 1995, Lasersohn 1995, 2011, Mayr 2015, Sauerland 2003, Sauerland, Anderssen, and Yatsushiro 2005, Spector 2007, Yatsushiro, Sauerland, and Alexiadou 2017, Zweig 2009; and see Kiparsky and Tonhauser 2012 for an overview).

Harbour (2014) (hereafter, simply Harbour) proposes a compositional theory of number that derives the crosslinguistic typology of grammatical number—that is, 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 plural arises. The main argument of this article is that a proposal to solve the inclusive-plurals problem that postulates unambiguously inclusive plural forms has problems of under- or overgeneration when considered together with Harbour’s proposal. Indeed, authors such as Dvorak and Sauerland (2006), Ivlieva (2013), Krifka (1989, 1995), Lasersohn (1995, 2011), Sauerland (2003), Sauerland, Anderssen, and Yatsushiro (2005), Spector (2007), Yatsushiro, Sauerland, and Alexiadou (2017), and Zweig (2009) have proposed that plural-marked DPs are semantically inclusive only, and argue that exclusive-plural interpretations arise as a by-product of independent, DP-unrelated mechanisms (sometimes, these are grammar-unrelated mechanisms as well) (I will call such systems inclusive-only systems). The undergeneration problem arises in languages that have number values such as dual or paucal, number values that are compositionally built on the semantically contentful, DP-structural feature [−atomic] in Harbour’s system. An inclusive-only approach to inclusive plural predicts that such languages cannot have inclusive plurals, contrary to fact. Certain versions of the inclusive-only account are shown to have the opposite problem, a problem of overgeneration, whereby unattested number systems, such as one that distinguishes only singular from dual, are incorrectly predicted to exist.

An alternative solution is to assume that plural forms are ambiguous between an exclusive and an inclusive semantics, as for example Farkas and de Swart (2010) argue. Combined with Harbour’s system, this type of approach entails that a [−atomic] feature in the structure of exclusive
plural DPs is responsible for exclusivity, and, I suggest, absence of number (NumP) in the structure of inclusive plural DPs is responsible for inclusivity. An advantage of this approach is that inclusive plurals can be subsumed under general number, a number distinction that some languages express overtly as a separate number category, as shown in Corbett 2000, thus removing part of the stipulative nature of Farkas and de Swart’s proposal. Because this solution retains the mechanism for generating dual and paucal number values (namely, [−atomic]), and an independent solution to the inclusive-plurals problem is provided, the under- and overgeneration problems of the inclusive-only approaches disappear. Another way to avoid these problems is to adopt Mayr’s (2015) proposal of using a predicate-level exhaustivity operator in the structure of exclusive-plural DPs, instead of [−atomic], a possibility I discuss as well.

The empirical focus of the article is on the semantics of common, count nouns (more specifically, bare plurals). Of course, pronouns, and other categories that go beyond the nominal domain, such as verbs, may also display grammatical number (see Corbett 2000 for many illustrations, in many languages). Pronouns are special, since, typically, languages display grammatical number on them, and Harbour’s theory of number draws heavily on pronominal paradigms. While nothing in what I 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 interpretation in this article. 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).

My argument is independent of the particular mechanism that inclusive-only approaches might use to derive exclusive-plural interpretations (e.g., Maximize Presupposition, DP-unrelated exhaustivity operators/higher-order implicatures), and the status of number information in the semantics of features (presupposition vs. entailment). While the proper explanation of certain well-known, recalcitrant problems in the inclusive-plurals literature (such as the problem of nonmonotonic environments, e.g., *Exactly one student read books*) might be an issue for some theories that do use DP-structural means for deriving exclusive-plural interpretations, these issues are orthogonal to the argument presented in this article. For example, some inclusive-only approaches, such as Spector’s (2007), have solutions for the problem of nonmonotonic environments but are subject to the criticism presented here. On the other hand, some non-inclusive-only approaches, such as Farkas and de Swart’s (2010), do not have a solution for the problem of nonmonotonic environments but are not subject to the criticism presented here. My goal here is to bring to light ways in which the crosslinguistic typology of grammatical number may inform the debate on the correct account of inclusive plurals.

The article is organized as follows. Section 2 introduces the basics of Harbour’s approach. Section 3 discusses the problem of inclusive plurals as it arises in this theory and provides arguments against solving it by postulating that exclusive-plural DPs in languages with inclusive plurals are not exclusive semantically. Section 4 shows that ambiguity approaches—that is, those in which plural DPs are ambiguous between an exclusive, [−atomic] semantics and an inclusive semantics—do not suffer from these problems as a matter of principle. Neither does replacing [−atomic] with Mayr’s (2015) predicative-level exhaustivity operator. Section 5 concludes.
2 Harbour’s (2014) Theory

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, and 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 later on. (For detailed discussion of other number values, see Corbett 2000 and Harbour 2011, 2014.)

Consider Ljubljana Slovenian, a dialect of Slovenian spoken in and around Ljubljana. As shown in the (partial) 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, pers. comm.; for standard Slovenian, see Derganc 2003, Herrity 2016, Marušič and Žaucer to appear, Toporišič 2000). 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.).

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

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Ljubljana Slovenian nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom</td>
<td>Acc</td>
</tr>
<tr>
<td>Masc</td>
<td>SG</td>
</tr>
<tr>
<td>stol</td>
<td>DU</td>
</tr>
<tr>
<td>‘chair’</td>
<td>PL</td>
</tr>
<tr>
<td>Fem</td>
<td>SG</td>
</tr>
<tr>
<td>hiša</td>
<td>DU</td>
</tr>
<tr>
<td>‘house’</td>
<td>PL</td>
</tr>
<tr>
<td>Neut</td>
<td>SG</td>
</tr>
<tr>
<td>mesto</td>
<td>DU</td>
</tr>
<tr>
<td>‘town’</td>
<td>PL</td>
</tr>
</tbody>
</table>

4 There is a second declension for feminine nouns, which is not shown here.

5 Key to abbreviations in glosses: 1 = first person; 2 = second person; 3 = third person; ACC = accusative case; ANIM = animate; AUX = auxiliary; DAT = dative case; DEF = definite; DEM = demonstrative; DU = dual; FEM = feminine; GEN = genitive case; GENERAL = general number; INANIM = inanimate; INDEF = indefinite; INST = instrumental case; LOC = locative case; MASC = masculine; NEG = negation; NEUT = neuter; NOM = nominative case; PAST = past tense; PAUC = paucal; PL = plural; PRES = present; PRON = pronoun; PTC = participle; Q = question operator; SG = singular.

6 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, pers. comm.).
Bayso, a Cushitic language spoken in Ethiopia, whose nouns distinguish singular, paucal, and plural as shown in table 2 (Corbett 2000, 2012:224–233, Hayward 1978, 1979) (in addition to general number, discussed in section 4). Paucal forms, such as lubanjaa ‘lion.PAUC’ in (3b), indicate that a small number of entities 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 pro-nouns as well).

(3) Bayso
   a. Lubán-titi hudure.
      lion-SG sleep.MASC.SG.PAST
      ‘A single/particular lion slept.’
   b. Luban-jaa hudureene.
      lion-PAUC sleep.PL.PAST
      ‘A few lions slept.’
   c. Luban-jool hudure.
      lion-PL sleep.MASC.SG.PAST
      ‘Lions slept.’
      (Corbett 2012:230)

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

\[
\begin{array}{|c|c|c|}
\hline
\text{Singular} & \text{Paucal} & \text{Plural} \\
\hline
\text{‘lion’} & \text{lubán-titi} & \text{lubanjaa} & \text{lubanjool} \\
\text{‘bull’} & \text{ártiti} & \text{aaraajaa} & \text{aaraar} \\
\text{‘sister’} & \text{abbati} & \text{abbajaa} & \text{abbalaal} \\
\text{‘bird’} & \text{kimbírtiti} & \text{kimbirjaa} & \text{kimbirjool} \\
\text{‘ear’} & \text{nebeti} & \text{nebejaa} & \text{nebebboo} \\
\hline
\end{array}
\]
Table 3
Biak demonstratives and determiners

<table>
<thead>
<tr>
<th></th>
<th>Singular</th>
<th>Dual</th>
<th>Paucal</th>
<th>Plural (anim)</th>
<th>Plural (inanim)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal</td>
<td>ine</td>
<td>suine</td>
<td>skoine</td>
<td>sine</td>
<td>na(ne)</td>
</tr>
<tr>
<td>demonstrative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definite</td>
<td>i/ya</td>
<td>sui/suya</td>
<td>skoi/skoya</td>
<td>si/sya</td>
<td>na</td>
</tr>
<tr>
<td>determiner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

possessive pronouns, as Dalrymple and Mofu (2013) illustrate. Table 3 shows the number distinctions made on (proximal) demonstratives and definite determiners in this language. Even though Biak nouns themselves do not (overtly) mark these distinctions, elements that accompany them in the noun phrase do. (4) provides some examples (the range of the paucal starts at three and may go up to about ten; Mary Dalrymple, pers. comm.).

(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.’

(Dalrymple and Mofu 2013:45)

In addition to the systems exemplified here, the crosslinguistic typology of number includes languages with no number (Pirahã, Everett 1986:217, Corbett 2000:50–51; Déné Súliné, Wilhelm 2008), singular–dual–lesser paucal–greater paucal–plural systems (e.g., Sursurunga, 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 more, 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 crosslinguistic generalizations is given in (5) (based on 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 crosslinguistic typology of number is to explain the important fact that, as (5) shows, not all logically possible number value combinations constitute possible number systems. Harbour’s 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 morphophonological and morphosyntactic realization of features in different languages. Harbour’s main assumptions are as follows: (a) NumP takes nP as complement, as in (6); (b) n⁰ assigns roots to the category of nouns and structures them into semilattices; (c) only three features can appear in Num⁰: [±additive], [±atomic], [±minimal], as in (6); (d) these features operate on the lattices provided by nP; (e) the repetition of a particular feature in Num⁰ 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, and lesser and greater paucals; see Harbour 2011, 2014 for more details). Assumptions (a), (b), and (d) are quite commonly made in the literature.⁷

(6) DP
   /\               /\   
  NumP             Num⁰   nP
  /\               /\          /\     
  Num⁰             n⁰         √

Assuming a simplified model with just three individuals in it (a, b, and c), what n⁰ is taken to do to roots is to structure them into the join semilattice in (7).

(7) abc
   /\               /\   
  ab   ac   bc
  /\       /\       /\
  a   b   c

⁷ Other syntactic projections inside DP are of course possible, but they are irrelevant for my purposes.
Equivalently:

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

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

(9) \([+\text{atomic}] = \lambda P. \lambda x. P(x) \& \text{atom}(x)\)
\([-\text{atomic}] = \lambda P. \lambda x. P(x) \& \neg \text{atom}(x)\)

(10) \([+\text{minimal}] = \lambda P. \lambda x. P(x) \& \neg \exists y \ P(y) \& y \sqsupset x\)
\([-\text{minimal}] = \lambda P. \lambda x. P(x) \& \exists y \ P(y) \& y \sqsupset x\)

(11) \([+\text{additive}] = \lambda P. \lambda x. Q(x) \& Q \sqsupset P \& \forall y \ Q(y) \rightarrow Q(x \sqcup y)\)
\([-\text{additive}] = \lambda P. \lambda x. Q(x) \& Q \sqsupset P \& \neg \forall y \ Q(y) \rightarrow Q(x \sqcup y)\)

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

Let us 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 \(\text{Num}^0\) are \([+\text{atomic}]\).

\(\text{(12)}\)

\[
\begin{array}{c}
\text{NumP} \\
\quad \text{Num}^0 \\
\quad [+\text{atomic}] \\
\quad n^0 \\
\quad \checkmark
\end{array}
\]

\(\text{(13)}\)

\[
\begin{array}{c}
\text{NumP} \\
\quad \text{Num}^0 \\
\quad [-\text{atomic}] \\
\quad n^0 \\
\quad \checkmark
\end{array}
\]

\[\text{I deviate from Harbour’s system in that I treat the contribution of the number features to be entirely made up of entailments, whereas in that system some of their content is presupposed. Nothing of what I say here depends on this. [+Atomic] is of type (e,t), not (et,et), in Harbour’s proposal, but, again, the difference is not important here. Lowercase variable names range over both atomic and nonatomic individuals. \sqsupset is the proper subpart relation. In the denotation for [+additive], in (11), Q is a free variable and \sqcup \text{is the join operation. It is not entirely clear in Harbour’s system why there is a need to use a free variable Q in the denotation of [+additive]. [+Additive] returns as output a proper subset Q of P that contains the join of any two elements; [-additive] returns a proper subset that does not.}\]
(14) gives rise to a singular semantics, and (15), to a strictly plural semantics:9

\[
(14) \quad \llbracket (12) \rrbracket = \llbracket \text{NumP} \rrbracket = \llbracket [+\text{atomic}]([\text{nP}]) \rrbracket = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \text{atom}(x)
\]

\[
(15) \quad \llbracket (13) \rrbracket = \llbracket \text{NumP} \rrbracket = \llbracket [-\text{atomic}]([\text{nP}]) \rrbracket = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \neg \text{atom}(x)
\]

Importantly, the structure that gives rise to (15) (i.e., to exclusive-plural interpretations) contains a \([-\text{atomic}]\) feature. In English, \([+\text{atomic}]\) is not morphologically realized overtly, but \([-\text{atomic}]\) is, as \(-s\).10

As Harbour (2011) observes, the same result is obtained if a system allows just \([\pm\text{minimal}]\) in \text{Num}9 (and does not allow repetition of features, (e)), since the set of elements in (7) that have no subparts (\([+\text{minimal}]\)) coincides with the set of atoms (\([+\text{atomic}]\)), and the set of elements in (7) that have subparts (\([-\text{minimal}]\)) coincides with the set of nonatoms (\([-\text{atomic}]\)). Thus, there might be cases where it is not possible to distinguish \([\pm\text{minimal}]\) from \([\pm\text{atomic}]\). 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 \([\pm\text{atomic}]\) and \([\pm\text{minimal}]\) in \text{Num}9.

Consider the following feature combinations (cf. Harbour 2011, Noyer 1992):

\[
(16) \quad \begin{align*}
\text{a.} & \quad [[+\text{minimal}]([+\text{atomic}]([\text{nP}]))] = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \text{atom}(x) \& \neg \exists y \text{ atom}(y) \& y \sqsubset x \\
\text{b.} & \quad [[+\text{minimal}]([-\text{atomic}]([\text{nP}]))] = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \neg \text{atom}(x) \& \neg \exists y \neg \text{atom}(y) \& y \sqsubset x \\
\text{c.} & \quad [[-\text{minimal}]([-\text{atomic}]([\text{nP}]))] = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \neg \text{atom}(x) \& \exists y \neg \text{atom}(y) \& y \sqsubset x \\
\text{d.} & \quad [(-\text{minimal})([+\text{atomic}]([\text{nP}]))] = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \text{atom}(x) \& \exists y \text{ atom}(y) \& y \sqsubset x
\end{align*}
\]

The feature combination in (16a) yields the singular number value. Both (16b) and (16c) will be crucial here: (16b) yields the dual number value (informally, \([-\text{atomic}]\) eliminates the atoms, and \([+\text{minimal}]\) chooses the bottommost layer of the lattice after that, which is composed of all the pluralities constituted of two atoms). (16c) yields plural (for more than two referents). Since

9 Given the semantics of \([\pm\text{atomic}]\), it will not be possible to repeat this feature, per (e), since nothing can satisfy (i).

\[
(i) \quad [[+\text{atomic}]([-\text{atomic}]([\text{nP}]))] = \llbracket [-\text{atomic}]([+\text{atomic}]([\text{nP}])) \rrbracket = \lambda x. \llbracket \text{nP} \rrbracket(x) \& \neg \text{atom}(x) \& \text{atom}(x)
\]

Footnote 11 provides some detail into the workings of assumption (e).

10 Harbour is not explicit about how van Benthem’s problem (van Benthem 1986) might be addressed in his system. The problem can be seen to arise in (i), for example.

(i) \([A \text{ dog is barking}] = 1 \iff \exists x \text{ dog}(x) \& \text{atom}(x) \& \text{is barking}(x)\)

If (i) is correct and all there is to say about the English sentence \textit{A dog is barking}, then that sentence is predicted to be compatible with a situation in which many dogs are barking and equivalent to \textit{One or more dogs are barking}, which does not seem intuitively correct. This suggests that the denotation of indefinites is more involved than mere existential quantification would suggest, or that there are further processes at work that exclude the unwanted situations. The problem will arise for nouns marked for numbers other than plural. I cannot decide this matter here.
nothing can satisfy (16d) (atoms do not have atoms as proper parts), (16d) does not give rise to a number value.\footnote{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, \([\text{atomic}]\) and \([\pm\text{minimal}]\), which is subject to the additional constraint ((f) above) that its semantic range is subject to social convention. Let us consider the simplest system that contains a paucal, a \([\pm\text{additive}, \pm\text{atomic}]\) system, exemplified by Bayso above.}

This decompositional analysis of the dual into \([-\text{atomic}]\) and \([+\text{minimal}]\) is attractive for a number of reasons. First, there is no need to postulate a primitive feature \([\text{DUAL}]\). Instead, the derivation of this number value is achieved by features, \([+\text{minimal}]\) and \([-\text{atomic}]\), that are justified separately elsewhere (for more on \([+\text{minimal}]\), see Harbour 2011 and footnote 11). This in turn means that the implicational universals in (5) concerned with the dual follow from the fact that the feature \([-\text{atomic}]\) is used. Those universals say that there is no language with dual that does not also have singular and plural. If \([-\text{atomic}]\) 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 \([-\text{atomic}]\) is used, then \([\pm\text{atomic}]\), which is involved in the singular, is used too. Patterns of morphological realization and agreement in different languages can also be explained (see Harbour 2014 and Noyer 1992 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). The compositional account of these generalizations within Harbour’s system will play an important role in my arguments in section 3.

Paucals are derived using the feature \([-\text{additive}]\), which is subject to the additional constraint ((f) above) that its semantic range is subject to social convention. Let us consider the simplest system that contains a paucal, a \([\pm\text{additive}, \pm\text{atomic}]\) system, exemplified by Bayso above.

\begin{align*}
(17) & \quad \text{a. } \llbracket-\text{additive}\rrbracket(\llbracket+\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket)) = \\
& \quad \lambda x. \llbracket Q(x) & Q \llbracket +\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket) & \forall y \ Q(y) \rightarrow Q(x \_\ y) \\
& \quad \text{b. } \llbracket-\text{additive}\rrbracket(\llbracket-\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket)) = \\
& \quad \lambda x. \llbracket Q(x) & Q \llbracket -\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket) & \forall y \ Q(y) \rightarrow Q(x \_\ y) \\
& \quad \text{c. } \llbracket+\text{additive}\rrbracket(\llbracket-\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket)) = \\
& \quad \lambda x. \llbracket Q(x) & Q \llbracket -\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket) & \forall y \ Q(y) \rightarrow Q(x \_\ y) \\
& \quad \text{d. } \llbracket+\text{additive}\rrbracket(\llbracket+\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket)) = \\
& \quad \lambda x. \llbracket Q(x) & Q \llbracket +\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket) & \forall y \ Q(y) \rightarrow Q(x \_\ y)
\end{align*}

\footnote{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, \([+\text{minimal}]\) \neq \([\text{atomic}]\), 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 United States (Harbour 2011, Noyer 1992), and minimal–unit augmented–augmented systems like that of Rembarrnga, an Australian language (Corbett 2000:166, Harbour 2011, McKay 1978), make use of \([\pm\text{minimal}]\), and Rembarrnga allows its repetition (assumption (e)). Consider also the trial. This is a number value that arises in systems that use both \([\pm\text{minimal}]\) and \([\pm\text{atomic}]\), and where \([\pm\text{minimal}]\) 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:

(i) \(\llbracket+\text{minimal}\rrbracket(\llbracket-\text{minimal}\rrbracket(\llbracket-\text{atomic}\rrbracket(\llbracket\text{nP}\rrbracket)))) = \\
\quad \lambda x. \neg \text{atom}(x) & \exists y [ \neg \text{atom}(y) & y \llbracket x \rrbracket & \neg \exists y \exists y' [ \neg \text{atom}(y') & y' \llbracket x \rrbracket & y' \llbracket x \rrbracket]
\)

(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 (see (5)) follows from the fact that the dual is generated with a subset of the features used for the trial (\([+\text{minimal}]\) and \([-\text{atomic}]\), as in (16b)).}
[

\[\pm \text{Additive}\] is defined with reference to a proper subset \(Q\) of the characteristic set of the function denoted by its input. (17a) 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 \([+\text{atomic}]\) alone already characterizes the set of atoms. But it is more in evidence in (17b), which yields paucal number. (17b) denotes the set of nonatomic 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 \([-\text{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 in a given language. Not all speakers of this language might agree, per (f), and some might set the upper limit at, say, six. (17c) yields plural number (more on the semantics of the plural in languages with pacuals in section 4.2). (17d) yields no number value, as a set of atoms cannot be cumulative. Paucal number is not postulated as a primitive \([\text{paucal}]\). 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 \([-\text{atomic}]\) is used in deriving both the plural and the paucal, but the paucal requires an additional ingredient, \([-\text{additive}]\).\textsuperscript{12}

Consider, finally, the possibility that a language might make use of the three features \([\pm \text{additive}], [\pm \text{minimal}], \text{and } [\pm \text{atomic}]\). Such a system gives rise to the following number distinctions:

\[
\begin{align*}
(18) \ a. \ & [-\text{additive}][[+\text{minimal}][+\text{atomic}][nP]]) = & \text{(singular)} \\
& \lambda x. Q(x) & Q \sqsubset [[+\text{minimal}][+\text{atomic}][nP]]) & \text{& } \forall y \ Q(y) \rightarrow Q(x \sqsubseteq y) \\
& [\text{-additive}][[-\text{minimal}][-\text{atomic}][nP]]) = & \text{(dual)} \\
& \lambda x. Q(x) & Q \sqsubset [[-\text{minimal}][-\text{atomic}][nP]]) & \text{& } \forall y \ Q(y) \rightarrow Q(x \sqsubseteq y) \\
& [\text{-additive}][[-\text{minimal}][-\text{atomic}][nP]]) = & \text{(paucal)} \\
& \lambda x. Q(x) & Q \sqsubset [[-\text{minimal}][-\text{atomic}][nP]]) & \text{& } \forall y \ Q(y) \rightarrow Q(x \sqsubseteq y) \\
& [+\text{additive}][[-\text{minimal}][-\text{atomic}][nP]]) = & \text{(plural)} \\
& \lambda x. Q(x) & Q \sqsubset [[-\text{minimal}][-\text{atomic}][nP]]) & \text{& } \forall y \ Q(y) \rightarrow Q(x \sqsubseteq y)
\end{align*}
\]

Indeed, as described in section 1, Biak is such a number system (feature combinations not shown in (18) yield no number values), with the cut for \([\pm \text{additive}]\) conventionally set to low. A difference between Biak’s number system and others we have seen before is that the locus of the morphophonological realization of number features is not on nouns but on other elements in this language, in the noun phrase or elsewhere.

\textsuperscript{12} \text{Cuts for } [\pm \text{additive}] \text{ that are relatively high will give rise to other approximative number values, such as greater plurals. The feature } [\text{additive}] \text{ is argued in Harbour 2014:196–197 to be subject to further constraints: for example, only horizontal cuts of certain kinds are allowed.}
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 11). 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. For example, in a singular-dual-plural system, plural number arises from [−minimal, −atomic] and is thus used for three or more real-world entities. In a language in which plural number is just [−atomic] (i.e., 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, the semantic range of the plural goes beyond what Harbour’s theory predicts, as in some languages and in some contexts plurals can even be concerned with one or more real-world entities, as we saw. It is to this issue that we now turn.13

3 No [−Atomic] for Exclusive Plurals

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) and (21), but also in other downward-entailing contexts, such as (22) (restriction of no or few), (23) (if-clause), and (24) (restriction of a universal quantifier), and in questions, as in (25). Further examples of English exclusive plurals are provided in (26).

(21) *English*

a. I don’t have children.
b. Dogs are not barking at me.

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

(23) *English*

[Directed at one person:]14
If you spot horses in this picture, you will get a prize.

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

13 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 into 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.

14 With a singular addressee, we stay away from issues of dependent plurality (see Ivlieva 2013, Zweig 2009).
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(25) **English**
[Directed at one person:]
 a. Have you ever seen horses in this meadow?
     (Farkas and de Swart 2010:3)
 b. Did you eat apples today?

(26) **English**
 a. I have children.
 b. Dogs are barking at me.
     (Carlson 1977:97)

Inclusive plurals do not occur just in nonepisodic, generic, or law-like sentences, such as (21a), (24), and (25a)—they also occur in plain episodic sentences such as (20), (21b), (22), (23), and (25b). Inclusive plurals do not occur just in nonepisodic, generic, or law-like sentences, such as (21a), (24), and (25a)—they also occur in plain episodic sentences such as (20), (21b), (22), (23), and (25b).\(^{15}\)

These facts have been taken to show that plural forms in English are, semantically, not exclusive but inclusive (see Dvorak and Sauerland 2006, Krifka 1989, 1995, Ivlieva 2013, Lasersohn 1995, 2011, Sauerland 2003, Sauerland, Anderssen, and Yatsushiro 2005, Spector 2007, Yatsushiro, Sauerland, and Alexiadou 2017, Zweig 2009). The basic structure of the explanation in inclusive-only accounts contains three ingredients: (a) an inclusive, number-neutral semantics for common count plural nouns and DPs (e.g., as in (27) for the noun *cats*); (b) a singular semantics for singular nouns and DPs (e.g., as in (28)); and (c) a postcompositional mechanism that derives exclusive-plural meanings on the basis of (a) and (b).

\[
\begin{align*}
(27) \llbracket \text{cats} \rrbracket &= \lambda x. \text{cat}(x) \\
(28) \llbracket \text{cat} \rrbracket &= \lambda x. \text{cat}(x) \land \text{atom}(x)
\end{align*}
\]

In these accounts, nothing in the structure of plural DPs is responsible for exclusive-plural interpretations. The details of the postcompositional mechanism vary by account, but, at its most basic, the mechanism relies on competition between (a) and (b). Consider a negative context such as

\[^{15}\text{In other languages, plurals in sentences of the form of (21a), (24), and (25a) receive \textit{exclusive}, not inclusive, interpretations.}\]

(i) **Turkish**
 Çocuk-lar-in var mı?
 "Do you have two or more children?"
     (Görgülü 2012:98–99)

(ii) **Western Armenian**
 Bazdig-ner unis?
 "Do you have two or more children?"

(iii) **Brazilian Portuguese**
 O João não tem filhos. 
 "João does not have (two or more) children."
     (Martí 2008:7; cf. Müller 2002)

The claims about the interpretation of plural forms in these languages are not uncontroversial, though (see Renans et al. 2017 and Sağ 2017 for Turkish, for example).
(21a). An inclusive-only system straightforwardly assigns to (21a) the proposition that the speaker
does not have any children—and that is indeed the interpretation of the plural form in this example.
Exclusive interpretations can be explained by appealing to pragmatic competition between (a)
and (b). The proposition assigned by an inclusive-only system to a sentence such as (26a), an
upward-entailing context, is the proposition that the speaker has one or more children. This
proposition is less informative than/entailed by the proposition that results from the use of the
singular form, namely, that the speaker has exactly\(^{16}\) one child. Given Gricean competition, since
the speaker did not choose the more informative proposition, the hearer concludes that the weaker
proposition is false (i.e., the speaker does not have one child and he or she has more than one);
that is the exclusive interpretation that we find in (20).\(^{17}\) The important ingredient of inclusive-
only accounts for the argument that follows is that the only semantic option for plural forms is
(a). Other details, such as the particular nature of (c), are independent of my argument.

In this section I consider, and argue against, two possible modifications to Harbour’s system
that are intended to solve the inclusive-plurals problem. The two modifications involve dispensing
with semantic plurality—that is, with [−atomic]—to different degrees, so as to preserve the
inclusive-only type of account. According to the first modification, discussed in section 3.1,
languages with inclusive plurals have number systems that dispense entirely with [−atomic]. My
argument against this solution is that it predicts that languages with inclusive plurals and
[−atomic]-based number values such as dual or paucal should not exist, contrary to fact. According
to the second modification, discussed in section 3.2, languages with inclusive plurals have number
systems that dispense with [−atomic] only for inclusive plurals. My argument is that the crosslin-
guistic typology of number that Harbour’s theory is designed to capture is no longer captured if
the theory is modified in this way.

3.1 No [−Atomic] at All

The first version of the inclusive-only approach to the inclusive-plurals problem involves the
following claim: languages with inclusive plurals do not make use of a feature [−atomic] at all
for count nouns. The basic idea is that the denotations of singular and plural forms in a language
like English are as follows:

\[(29)\]

\begin{align*}
\text{(a) } \llbracket \text{cat}\rrbracket &= \llbracket [-\text{atomic}] (\llbracket \text{nP}\rrbracket) = \lambda x. x \text{ is a cat } \& \text{ atom}(x) \\
\text{(b) } \llbracket \text{cats}\rrbracket &= \llbracket \text{nP}\rrbracket = \lambda x. x \text{ is a cat}
\end{align*}

\[(29a)\] assigns an atomic semantics to singular DPs, and \[(29b)\] assigns a number-neutral semantics
to plural DPs. There is no [−atomic] feature at all in this number system. This solution involves
modifying Harbour’s theory so that the features [+atomic] and [−atomic] do not necessarily go

\(^{16}\) Per Spector 2007.

\(^{17}\) Two notes are in order here. First, this impressionistic explanation is not quite right. As has often been pointed
out (see, e.g., Sauerland 2005; also Chierchia, Fox, and Spector 2012), what Gricean competition delivers is the weaker
proposition that the speaker does not believe that he or she has one child.

Second, questions, as in (25), are not, strictly speaking, downward-entailing (though negative polarity items are
licensed in questions; Guerzoni and Sharvit 2007, Ladusaw 1996) and are, implicitly or explicitly, put aside in all accounts
of inclusive plurals (though see Grimm 2012).
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 (recall footnote 15). The approaches of Krifka (1989, 1995), Ivlieva (2013), Lasersohn (1995, 2011), Sauerland (2003), Sauerland, Anderssen, and Yatsushiro (2005), Spector (2007), Yatsu- shiro, Sauerland, and Alexiadou (2017), and Zweig (2009) can be implemented within Harbour’s theory in this manner.

The logic of my argument against this solution is as follows. If systems that dispense with [−atomic] altogether are allowed in Harbour’s theory, then a language that has inclusive plurals must be one such system. Harbour’s 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 and paucal. However, this prediction is wrong, since languages with [−atomic]-based number values and inclusive plurals exist. I argue that Ljubljana Slovenian and Biak are such languages.

Let us consider Slovenian first. Dual inflection is present on verbs, adjectives, cardinal numerals, nouns, and various kinds of pronouns in Ljubljana Slovenian (Derganc 2003, Herrity 2016, Marušič and Žaucer to appear, Toporišić 2000) (recall section 2). Initial examples of the dual are as follows:

(30) **Ljubljana Slovenian**

Midva rada planinariva.

we.nom.masc.du willing.masc.du hike.1du

‘The two of us like to hike.’

(31) **Ljubljana Slovenian**

Na betonski Pingpong mizi sta fanta igrala Pingpong.

on concrete Ping-Pong table aux.du boy.nom.masc.du play.ptc.masc.du Ping-Pong

‘(The) two boys played Ping-Pong on the concrete Ping-Pong table.’

Example (30) shows the dual form of the first person pronoun in subject position, with agreeing elements in the dual. (31) shows a dual noun also in subject position, with the auxiliary and the verb in agreement. As shown in (31), dual number is compatible with both definite and indefinite interpretations.18

Importantly, Ljubljana Slovenian has inclusive plurals. Given the amount of syncretism between dual and plural forms in the feminine and the neuter in this language (recall table 1), the nouns that show this best are masculine nouns in either accusative or nominative case, since there the dual is clearly different from the plural. With this in mind, consider (32) and (33). In

18 More support seems needed from the context in order to fully license the indefinite interpretation in this case—for example, 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 statement that is too strong, given the availability of indefinite, nonpresuppositional interpretations in this and other examples in this article. With personal pronouns, as in (30), only definite interpretations are possible, personal pronouns themselves being definite.
seeing just one horse in the meadow already wins you the prize, and question (33A) can be answered as in (33B), which also indicates an inclusive-plural interpretation (recall the parallel English examples above).

(32) Ljubljana Slovenian
Kdor prvi zagleda konje na tem travniku, dobi nagrado.

who first see horse.ACC.MASC.PL on this meadow win prize

‘Whoever first sees horses in this meadow wins a prize.’

(33) Ljubljana Slovenian

A: Ali ima Peter otroke?

Q have Peter child.ACC.MASC.PL

‘Does Peter have children?’

B: Ja. Ima enega.

yes has one

‘Yes, he has one.’

In certain cases in even the masculine declension, the plural and dual forms are syncretic, so fantom in an example such as (34), while receiving an inclusive-plural interpretation, is either the dual or the plural form.

(34) Ljubljana Slovenian
Do danes fantom (še) nisem pomagal.

until today boy.DAT.MASC.DU/PL yet NEG.AUX.1SG help.PTC.SG

‘Until today I didn’t help boys.’

Making the noun unambiguously dual, however, as in (35), brings out an interpretation in which the dual is negated.

(35) 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.’

Since such a negated dual interpretation is absent in (34), the claim that (34) involves the use of an inclusive plural seems correct, with (negated) dual interpretations arising only when the form is unambiguously dual, as in (35). In the nominative case, nouns in the feminine declension also show syncretism, but it is possible to disambiguate by combining them with agreeing verbs, as in (36) (recall footnote 6).¹⁹

(36) Ljubljana Slovenian
Rože ne cvetijo.

flower.NOM.FEM.PL NEG blossom.3PL

‘(The) flowers aren’t blossoming.’

¹⁹ Thanks to Christina Sevdali for asking about this example.
The form rože may be either dual or plural, but in (36), the agreeing verb indicates that it is the plural version that is chosen. (36) receives an inclusive-plural interpretation. Consider also (37) and (38).

(37) Ljubljana Slovenian
Nimam otrok.
NEG. have.1SG child.GEN.MASC.DU/PL
‘I don’t have children.’

(38) Ljubljana Slovenian
Ne vidim konjev na travniku.
NEG see horse.GEN.MASC.DU/PL on meadow
‘I didn’t see horses in the meadow.’

Even verbs that normally take accusative objects must take genitive ones in the context of negation in (Ljubljana) Slovenian, a phenomenon (well-known in the context of Slavic languages) referred to as genitive of negation. Since the dual and the plural are always syncretic in the genitive case (recall table 1), it is not possible to tell which form is being used in (37) and (38), the dual or the plural. As before, however, (37) and (38) are interpreted inclusively and are not ambiguous between an inclusive-plural reading and a negated dual reading. For the latter, unambiguously dual forms are needed, as in (39) and (40), where the numeral dveh ‘two’ requires dual.

(39) Ljubljana Slovenian
Nimam dveh otrok.
NEG. have.1SG two.GEN.MASC.DU child.GEN.MASC.DU
‘I don’t have two children.’

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

Inclusive-plural interpretations also arise in the restriction of universal quantifiers, another downward-entailing context, as shown in (41).

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

Example (34), with the plural form in a negative environment, contrasts with an example like (42), 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 (41) contrasts with (43), 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).²⁰

(43) Ljubljana Slovenian
Ena hiša ki ima okna s pogledom na morje je precenjena.
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] at all for this language predicts that its number system should not have a dual number value, since [−atomic] would not be available to derive the dual. However, Ljubljana Slovenian has a singular-dual-plural system for 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.

It is possible to make the same argument with languages that have other number values based on [−atomic]. One such language is Biak, the Indonesian language discussed in section 2, with the caveat that here number features are not expressed on nouns: 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.’
(Dalrymple and Mofu 2013:47)

(45) Biak
Ikak s-arek i.
snake 3pl.anim-bite pron.3sg
‘Snakes bit him.’ (at least four snakes)
(Dalrymple and Mofu 2013:47)

²⁰ In (42) and (43), some speakers report that an inclusive interpretation is possible if the example is interpreted “in a sort of generic way.” This is not at all unexpected in languages with inclusive plurals; something similar happens in English. For more on this, see footnote 24.
Bare dual and paucal nouns cannot serve as subjects for independent reasons in Biak (see Dalrymple and Mofu 2013:49–50), but nonbare ones show the corresponding verbal agreement, as (46) and (47) illustrate.

(46) **Biak**
   Ikak *(suya) su-arek i.
   snake  DEF.3DU 3DU-bite PRON.3SG
   ‘The two snakes bit him.’
   (Dalrymple and Mofu 2013:50)

(47) **Biak**
   Ikak *(skoya) sko-arek i.
   snake  DEF.3PAUC 3PAUC-bite PRON.3SG
   ‘The three/several snakes bit him.’
   (Dalrymple and Mofu 2013:50)

As we saw, in Harbour’s terms, Biak is [+additive, ±minimal, ±atomic], with duals and paucals, that is, with number values built with [−atomic]. Yet, as Dalrymple and Mofu (2013) argue, Biak has inclusive plurals.

(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.’
   (Dalrymple and Mofu 2013:49)

(49) **Biak**
   Ikak (ono) s-arek i ke?
   snake  INDEF 3PL.ANIM-bite PRON.3SG Q
   ‘Did snakes bite him?’
   (Dalrymple and Mofu 2013:49)

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; a negative one, that no snakes did. Again, a solution to the inclusive-plurals problem that assumes just an inclusive semantics for plural DPs, coupled with Harbour’s decompositional account of duals and paucals, predicts that Biak should not have inclusive plurals, contrary to fact.

3.2 [−Atomic] Sometimes

A second version of the inclusive-only approach to inclusive plurals involves the following claim: languages with inclusive plurals do not use [−atomic] for plural DPs, but may use [−atomic] elsewhere, for example, for dual DPs.\(^{21}\) Consider a language with a singular-dual-plural number

---

\(^{21}\) Thanks to an anonymous reviewer for suggesting this possibility.
system and inclusive plurals, such as Ljubljana Slovenian. According to this version, we would have the following denotations:

\[(50)\]

\[\begin{align*}
\text{a. } & \quad \llbracket \text{stol} \rrbracket = \llbracket +\text{minimal} \rrbracket \llbracket +\text{atomic} \rrbracket \llbracket \text{nP} \rrbracket ) = \\
& \quad \lambda x. \ x \text{ is a chair } \& \ \text{atom}(x) \ & \ \neg \exists y \ \text{atom}(y) \ & \ y \subset x
\end{align*}\]

\[\begin{align*}
\text{b. } & \quad \llbracket \text{stola} \rrbracket = \llbracket +\text{minimal} \rrbracket \llbracket -\text{atomic} \rrbracket \llbracket \text{nP} \rrbracket ) = \\
& \quad \lambda x. \ x \text{ is a chair } \& \ \neg \text{atom}(x) \ & \ \neg \exists y \ \neg \text{atom}(y) \ & \ y \subset x
\end{align*}\]

\[\begin{align*}
\text{c. } & \quad \llbracket \text{stoli} \rrbracket = \llbracket \text{nP} \rrbracket = \\
& \quad \lambda x. \ x \text{ is a chair}
\end{align*}\]

The basic idea is that duals (or paucals) are not built of the same building blocks as plural forms. Because the denotation of plural forms needs to be inclusive, \([\text{-minimal}]\) is not used in (50c), and thus perhaps not at all for Ljubljana Slovenian.\(^{22}\)


This version of the inclusive-only approach is also problematic. The explanatory power of Harbour’s theory relies on certain number values being generated using the same feature. But in (50), whereas dual forms would use \([\text{-atomic}]\), plural forms would not. As Nevins (2011) has argued, the formal link between duals and plurals, pioneered by Noyer (1992) and adopted by Harbour (2011, 2014), is crucial in the account of the crosslinguistic typology of number. For example, because both duals and plurals make use of the feature \([\text{-atomic}]\), the prediction is that no language should exist with dual but no plural. This is the correct prediction, as we know (see section 2). Related to this is that dual is lost before plural in the course of language change, never the other way around, a fact that a decompositional account of the dual is designed to explain.

Consider the decompositional analysis of singular-dual-plural systems in (16), repeated in (51), where there are three possible paths of loss: either the feature \([\text{±minimal}]\) is lost, the feature \([\text{±atomic}]\) is lost, or both features are lost. If both features are lost at the same time, the language becomes a language with no grammatical number. More interesting is the loss of the feature \([\text{-minimal}]\), which results in the singular-plural system in (52), with (52b) and (52c) now equivalent (on the assumption that, since the dual meaning is lost with the loss of \([\text{-minimal}]\), the form that used to spell out that meaning is lost).

\[(51)\]

\[\begin{align*}
\text{a. } & \quad \llbracket +\text{minimal} \rrbracket \llbracket +\text{atomic} \rrbracket \llbracket \text{nP} \rrbracket ) = \\
& \quad \lambda x. \ [\text{nP}] (x) \ & \ \text{atom}(x) \ & \ \neg \exists y \ \text{atom}(y) \ & \ y \subset x
\end{align*}\]

\[\begin{align*}
\text{b. } & \quad \llbracket +\text{minimal} \rrbracket \llbracket -\text{atomic} \rrbracket \llbracket \text{nP} \rrbracket ) = \\
& \quad \lambda x. \ [\text{nP}] (x) \ & \ \neg \text{atom}(x) \ & \ \neg \exists y \ \neg \text{atom}(y) \ & \ y \subset x
\end{align*}\]

\[\begin{align*}
\text{c. } & \quad \llbracket -\text{minimal} \rrbracket \llbracket -\text{atomic} \rrbracket \llbracket \text{nP} \rrbracket ) = \\
& \quad \lambda x. \ [\text{nP}] (x) \ & \ \neg \text{atom}(x) \ & \ \exists y \ \neg \text{atom}(y) \ & \ y \subset x
\end{align*}\]

\(^{22}\) It is likely that the complete omission of \([\text{-minimal}]\) from such a system will create problems not too dissimilar from the undergeneration problem of the first version, discussed in section 3.1, but I leave the exploration of the consequences of positing \([\text{-minimal}]\)-less systems for another time.
(52) a. \(\lambda x. [nP](x) \& \text{atom}(x)\) = (singular)  
\[\]  
b. \(\lambda x. [nP](x) \& \neg\text{atom}(x)\) = (dual)  
\[\]  
c. \(\lambda x. [nP](x) \& \exists y [nP](y) \& y \subseteq x\) = (plural)  
\[\]

The loss of \([\pm\text{atomic}]\) results in a \([\pm\text{minimal}]\) system, possibly also a singular-plural system, with (53a) and (53b) now equivalent.

(53) a. \(\lambda x. [nP](x) \& \neg\text{atom}(x)\) = (singular)  
\[\]  
b. \(\lambda x. [nP](x) \& \neg\text{atom}(x)\) = (dual)  
\[\]  
c. \(\lambda x. [nP](x) \& \exists y [nP](y) \& y \subseteq x\) = (plural)  
\[\]

In other words, in Harbour’s system, it is not possible to lose \([-\text{atomic}]\) in the plural without also losing it in the dual, and losing \([-\text{atomic}]\) in the dual entails losing the dual (likewise, it is not possible to lose \([+\text{minimal}]\) in the singular without also losing it in the dual, and losing \([+\text{minimal}]\) in the dual entails losing the dual). That dual is acquired by children after plural also follows from the decompositional account of the dual, as Nevins (2011) explains in more detail. According to the second version of the inclusive-only approach, however, losing (50c) does not entail losing (50b), since they have no features in common. This means that according to this version, languages with dual but no plural are possible—an overgeneration problem again. The approach also predicts that the plural can be lost before the dual in the course of language change, and that the dual can be acquired before the plural. Problems of this very nature will arise in any system with inclusive plurals and any other number values based on \([-\text{atomic}]\), such as paucals, exemplified above for Biak and Bayso.  

4 \([-\text{Atomic}]\) or Exhaustive Exclusive Plurals

4.1 Ambiguity Accounts

The basic structure of an ambiguity account of inclusive plurals contains three ingredients: (a) an inclusive, number-neutral semantics for common count plural forms; (b) an additional,
exclusive, strictly plural semantics for the same forms; and (c) a postcompositional mechanism that chooses between (a) and (b). In Farkas and de Swart 2010, (c) is the Strongest Meaning Hypothesis (from Dalrymple et al. 1998).

(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. (Farkas and de Swart 2010:28)

In this account, (a) and (b) give rise to interpretations that are in an asymmetric entailment relation. For example, with a sentence such as (19), repeated here as (55), if it is true that Lina harvested two or more tomatoes (exclusive interpretation), then it is necessarily true that Lina harvested one or more tomatoes (inclusive interpretation).

(55) *English*

Lina harvested tomatoes.

However, if Lina harvested one or more tomatoes (inclusive interpretation), it does not necessarily follow that Lina harvested two or more tomatoes (exclusive interpretation); she could have harvested an atomic individual tomato. In these circumstances, and everything else being equal, the Strongest Meaning Hypothesis applies and chooses the strongest, exclusive interpretation. In downward-entailing environments, such as the negative sentence in (20), repeated as (56), antecedents of conditionals, or restrictions of universal quantifiers, entailment relations are reversed.

(56) *English*

Lina didn’t harvest tomatoes.

In (56), the proposition that Lina harvested neither one nor more tomatoes (inclusive interpretation) asymmetrically entails and is thus stronger than the proposition that Lina did not harvest two or more tomatoes (exclusive interpretation). Thus, the result is that, everything else being equal, inclusive plurals occur in downward-entailing environments (and in questions; recall footnote 17), and exclusive plurals occur in upward-entailing environments, as desired. From the perspective of the argumentation in this article, the important difference between the inclusive-only accounts of section 3 and the ambiguity account just presented is that, semantically, the ambiguity account and Sauerland’s approach denotes just an identity function, without presuppositions. This proposal predicts that languages with duals and inclusive plurals are indeed possible, so the undergeneration problem discussed in section 3.1 does not arise. This is the case for any approach that pursues the second version: since, by definition, [–atomic] (or [–minimal]) is not used for plural forms, inclusive-plural forms are entirely possible. Crucially, however, assumption (a) stipulates the semantics of the dual as a primitive, and that does create a significant, overgeneration problem: if [DUAL] is a primitive feature, what prevents [TRIAL], [PAUCAL], [GREATER PLURAL], [MINIMAL], and so on, from being primitives as well? Nothing prevents any logically possible, but unattested, number system from being generated—for example, one with the features [SINGULAR] and [TRIAL], but no [DUAL] or [PLURAL].
postulates not one but two lexical entries for plural count nouns. The mechanisms assumed in the former to derive exclusive interpretations and in the latter to choose between competing interpretations are not the same, but the differences here are independent of my argument.24

In Harbour’s featural account, the implementation of the ambiguity account is concerned not with lexical entries but with the denotation, and presence, I suggest, of NumP. From this perspective, the idea is that plural count noun forms have two options with respect to NumP. The first option, for exclusive interpretations, involves for, say, English, the feature [−atomic] in Num0 (recall (13)).

![Diagram](attachment:Diagram.png)

For the same language, the second option, for inclusive interpretations, involves DPs with no NumP.

24 As Farkas and de Swart (2010) show, the Strongest Meaning Hypothesis 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. This is confirmed in English examples such as (i), where children is in an upward-entailing environment but interpreted inclusively, or Ljubljana Slovenian examples such as (ii).

(i) **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.

(ii) **Ljubljana Slovenian**

[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 DEM.PL toy.PL in house.DAT.FEM.SG AUX.PL child.NOM.MASC.PL

‘Look at all these toys—there are children in the house.’

The strongest meaning compatible with the knowledge state of the speaker is the inclusive meaning. Without information about the speaker’s knowledge, it is likely that hearers will make default assumptions, such as, for example, that the speaker is knowledgeable. Cases of downward-entailing environments with exclusive interpretations also exist (Chierchia, Fox, and Spector 2012:2318).

(iii) **English**

John may have read *one* book, but I don’t think he has read books.

Other accounts discussed here can also handle these examples. 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 the person in question is irrelevant), a prediction that remains to be verified.
Without NumP, the interpretation of the plural form contains both atoms and nonatoms and is thus inclusive. The Strongest Meaning Hypothesis, or whatever else one postulates for (c), will do the rest. In this account, plural forms in a language with inclusive plurals happen to spell out two different structures, (57) and (58).

The proposal just sketched does not run into the problems pointed out earlier for inclusive-only approaches. Languages with [−atomic]-based number values, such as dual (Ljubljana Slovenian) or paucal (Biak), and inclusive plurals are indeed predicted to be possible languages. Their account is just as in Harbour’s system (see section 2), with three crucial additions: plural forms in these languages can also spell out (58), languages have mechanisms that allow them to choose between (57) and (58) (e.g., the Strongest Meaning Hypothesis), and languages without inclusive plurals do not make use of (58). There are also no overgeneration problems of the kind discussed in section 3.2. Because plural forms and dual and paucal forms share the feature [− atomic], as in Harbour’s approach, the paths of acquisition and loss that Harbour explains can still be explained. For example, languages with duals but no plurals are still predicted not to be possible, since they both use [− atomic].

There are at least two important questions to answer at this point. The first is whether it is sensible to postulate (58) in Harbour’s system. The second is whether other ambiguity-based approaches would also work. The remainder of this section answers these questions.

(58) is in fact one possibility considered in Harbour 2014 for languages that make no grammatical number distinctions at all, such as Pirahã and Dëne Sulinë. The more interesting question is whether there is independent evidence that (58) is a possibility even in languages that do make grammatical distinctions. I argue that (58) is in fact a very plausible analysis for 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, which can coexist with other grammatical number distinctions (Corbett 2000, 2012).

Both Bayso and Fouta Jalon Fula (see table 4) make a singular-plural distinction, with Bayso having, in addition, a paucal number value, as we saw in section 2. In both languages, singular

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25 Harbour (2016:149–152) briefly entertains a solution to the inclusive-plurals problem that makes use of a function which, operating on the set of nonatoms provided by NumP, accesses the atoms that constitute them. This is another possible version of the ambiguity account. This version does not allow inclusive plurals to be subsumed under general number, since there would be no justification for using this procedure in the case of languages without grammatical number, such as Pirahã and Dëne Sulinë.

26 One can alternatively assume for these languages that NumP is generated as part of DPs, but these languages have no number features to generate in Num. It does not seem that this choice has consequences for the argumentation in this article, and I leave it unexplored here.
and plural (and paucal) are expressed via dedicated suffixes. They also have general number, expressed via bare stems. General number has the semantic import of number neutrality, as evidenced for Bayso in (59a) (Corbett 2000, 2012, Corbett and Hayward 1987, Hayward 1979) (recall (3)) (for Fouta Jalon Fula, see Corbett 2000:12 and Koval’ 1979 (cited in Corbett 2000)).

27

(59) **Bayso**

a. Luban hudure.
   lion.GENERAL sleep.MASC.SG.PAST
   ‘Lions/A lion slept.’

b. Lubán-titi hudure.
   lion-SG sleep.MASC.SG.PAST
   ‘A single/particular lion slept.’

c. Luban-jaa hudureene.
   lion-PAUC sleep.PL.PAST
   ‘A few lions slept.’

d. Luban-jool hudure.
   lion-PL sleep.MASC.SG.PAST
   ‘Lions slept.’

(Corbett 2012:230)

In Bayso, as Corbett (2012) shows, nouns in their general number form trigger patterns of verbal agreement that distinguish them from paucal and plural nouns. All paucal-marked nouns agree with the verb in the plural. Nouns that belong to the class of *lúban* ‘lion’ agree in masculine singular when in the general number, singular, and plural forms, as can be seen from (59a), (59b), and (59d). General number and singular are then distinguished by the morphology on the noun and their respective semantics, as the contrast between (59a) and (59b) illustrates. Nouns that belong to a separate class that includes *kimbír* ‘bird’ agree with the verb in the feminine

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27 I have not been able to find Koval’ 1979.

28 The basic agreement patterns in Bayso are determined on the basis of third person pronoun subject agreement. There is a three-way distinction here, *ásu* being the masculine singular form (with corresponding verbal agreement as in, e.g., *hudure* ‘sleep.PL.MASC.SG’; cf. (59)), *ésé* the feminine singular form (verbal agreement as in *hudurte* ‘sleep.PAST.FEM.SG’), and *ísó* the plural form (verbal agreement as in *hudureene* ‘sleep.PAST.PL.’) (Corbett 2012:226, Corbett and Hayward 1987:12).
singular when in the singular and 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 singular and the general form, but in plural when in the plural form, and so on. Thus, a
number category beyond singular-paucal-plural is necessary in Bayso.

Even though Harbour does not explicitly discuss general number in Bayso or Fouta Jalon
Fula, the analysis for these languages in his system is clear: both allow NumP to be absent, though
they do not force it to be so. When NumP is not generated as part of the structure of DP, nouns
are interpreted as number-neutral or inclusive. Morphologically, the absence of NumP in these
languages is realized as absence of number morphology. Semantically, general number forms are
number-neutral, in the sense that the set denoted by nP, not further operated on by Num^0, contains
both atomic and nonatomic individuals (recall (7) and (8)). Thus, a language like Bayso can
naturally be thought of in Harbour’s system as having a [±additive, ±atomic] system with optional
NumP.29 If this is correct, then more languages than appear at first sight make use of the treatment
of NumP that we find in Bayso or Fouta Jalon Fula, with one difference: languages may make
use of an already existing form to spell out (58). In particular, languages may use their plural
forms to do so. English, Ljubljana Slovenian, and Biak would be examples of such languages.30

Notice that combining this proposal for general number with the Strongest Meaning Hypothe-
sis does not produce ill results for languages like Bayso.31 In particular, because the Strongest

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29 Corbett (2000:12) observes that in languages that have general number forms, these are used “when number is
irrelevant.” That contexts of number irrelevance favor the use of general number forms suggests that, besides speaker
ignorance (see footnote 24), number irrelevance should play a role in the account of inclusive plurals if indeed these are
general number forms. This seems to be the case, as (i) illustrates.

(i) English
[The speaker works for the town government and is going around the neighborhood 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 (i); otherwise, 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.

30 As Gabi Danon (pers. comm.) points out, the question arises how subject-verb agreement works with general
number if English has general number. One answer is that plural agreement is the elsewhere case: singular subjects agree
in singular, and every other subject (plural, general number), in plural.

Another question is whether forms other than plural ones may also spell out (58)/be inclusive. As argued in Martí
2017 and Pereltsvaig 2014, inclusive plurals and inclusive singulars are two sides of the same phenomenon. The proposal
defended here predicts that there should be languages that choose a form different from the plural to spell out NumP-
less DPs. As argued in Martí 2017 and Sağ 2016, 2017, despite appearances, Turkish bare singulars are not a case in
point (cf. Corbett 2000). Brazilian Portuguese might be such a language, at least if Ferreira (2010) is right, but this
possibility needs to be further evaluated within the context of the rich literature that exists on the topic of Brazilian
Portuguese bare noun semantics, to which I cannot do justice here (see, e.g., Cyrino and Espinal 2015, Müller 2002,
Munn and Schmitt 2005, Pires de Oliveira and Rothstein 2011). Whether yet other forms, such as duals or paucals, may
also be inclusive remains to be explored.

31 Thanks to an anonymous reviewer for raising this issue.
Meaning Hypothesis is formulated with respect to a given expression (“when an expression is assigned a set of interpretations ordered by entailment”; my emphasis), it has nothing to say about the choice of general number forms vs. other forms when these forms are different. In other words, general number forms such as *luban* ‘lion’ are never in competition with singular (*luban-titi*), paucal (*lubanjaa*), or plural (*lubanjool*) forms according to the Strongest Meaning Hypothesis. This is as it should be, at least from what we know about Bayso, since in upward-entailing contexts such as (59a), general number forms give rise to inclusive, not exclusive, meanings.

Other versions of the ambiguity approach that avoid the problems of inclusive-only approaches are possible, but they are not without other problems.

Grimm (2012) defends an alternative ambiguity-based approach to the problem of inclusive plurals. He proposes that plural forms in English are lexically ambiguous between an exclusive and an inclusive interpretation. However, the inclusive interpretation is not simply stipulated—it is derived from kind interpretations. Starting with the kind *DOG*, for example, the set of instantiations of the kind is derived as the denotation of the plural form *dogs* (see Carlson 1977, Chierchia 1998, Krifka 1995). This leads to a number-neutral, inclusive interpretation, since both atomic and nonatomic dog individuals count as instantiations of the kind *DOG*. The distribution of exclusive and inclusive interpretations is, Grimm argues, sensitive to the episodic-generic distinction: inclusive, kind-based interpretations occur in kind/generic environments, and exclusive interpretations occur in episodic environments.

Because this approach does postulate the existence of (what in Harbour’s system would be) [–atomic] exclusive plurals, it does not suffer from the under- or overgeneration problems of inclusive-only approaches and is thus consistent with the thesis defended here. One important problem from the present perspective, however, is that kind interpretations cannot be the (only) source of inclusive plurals. In English, bare plurals like *parts of this machine* or *pieces of that puzzle* never denote kinds and therefore cannot be the subject of a kind predicate, as shown in (60) (Carlson 1977:318), yet inclusive interpretations are possible for them (Chierchia 1998:373, Van Geenhoven 2000:234), as shown in (61).

(60) *English*

??Parts of this machine are widespread.

(61) *English*

John didn’t see parts of this machine.

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**32** At least some inclusive-only approaches (see section 3) allow competition between meanings arising from different expressions (such as singular vs. semantically inclusive plural), which may be problematic. I leave the development of this argument for future research.

**33** The proposal predicts that plural DPs in Bayso are not ambiguous, and hence never give rise to inclusive plural interpretations. This prediction remains to be verified.

The proposal is compatible with there being other reasons that force a choice between the inclusive and the exclusive interpretations—for example, the existence of grammatical principles that are sensitive to the presence of atoms. Pereltsvaig (2014) argues that Russian inclusive plurals (general number plurals in the analysis in the text) are syntactically selected in a number of grammatical constructions.
Whether (61) allows wide scope (‘there are parts of this machine such that John didn’t see them’) in addition to narrow scope (‘it is not the case that John saw any parts of this machine’) is debatable (see Van Geenhoven 2000), but it is clear that (61) has a narrow scope interpretation, and that that interpretation is an inclusive one. Furthermore, a kind analysis is not an option for languages where nouns cannot denote kinds by themselves, such as Spanish, Italian, Hungarian, and Arabic, 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). Yet these languages may have inclusive plurals. Consider, for example, Spanish.

(62) Spanish
   a. En la ***India se están extinguiendo los tigres.***
      in the.FEM.SG India se.3PL.PRES extinguishing the.MASC.PL tiger.PL
      ‘Tigers are becoming extinct in India.’
      (McNally 2004:118)
   b. *En la India se están extinguiendo tigres.
      in the.FEM.SG India se.3PL.PRES extinguishing tiger.PL
      (Laca 1996:262, McNally 2004:118)

The subject of the predicate *extinguirse* ‘to become extinct’ is kind-denoting, and (62b) is ungrammatical (note that bare plural subjects are normally allowed in postverbal position in Spanish, as in (63) and (64)). On the other hand, (62a), where the plural form is accompanied by the definite article, is grammatical. Thus, plural forms in Spanish by themselves cannot produce a kind denotation. Yet Spanish has bare inclusive plurals, as in (63) (cf. (64)).

(63) Spanish
   A la reunión no asistieron profesores.
   to the meeting NEG attend.3PL.PAST professor.PL
   ‘The meeting was not attended by any professors.’
   (Laca 1996:253, Martí 2008:10, McNally 2004:120)

(64) Spanish
   A la reunión asistieron profesores.
   to the meeting attend.3PL.PAST professor.PL
   ‘The meeting was attended by professors.’

A further alternative ambiguity-based approach claims that the source of inclusive-plural interpretations is not kinds but noun incorporation (see, e.g., Baker 1988 and Mithun 1984, 1986 for early analyses of incorporation). This version of the ambiguity account would maintain (what in Harbour’s system are) [−atomic] exclusive plurals, like Grimm’s (2012) account, but would claim that the source of the number-neutral, inclusive interpretation of inclusive plurals is incorporation. Incorporated nominals tend to be interpreted number-neutrally (Carlson 2006, Dayal 2015). Van Geenhoven (1998) hypothesizes that, parallel to morphosyntactic incorporation, there is a corresponding rule of interpretation whereby a verb may introduce existential quantification over
its (property-denoting) object. Since Van Geenhoven assumes that nouns contain both atoms and nonatomics in their denotation, number neutrality results. Indeed, McNally (2004) and Van Geenhoven (2000) extend the use of semantic incorporation to bare plurals in Spanish and English, respectively, explicitly hypothesizing that application of the rule of semantic incorporation need not be accompanied by application of the morphosyntactic rule. A semantic incorporation analysis of inclusive plurals would say that plural forms undergo semantic incorporation in downward-entailing contexts (and questions); singular forms would not be subject to this rule at all (given, e.g., *I have child). Because this ambiguity-based account would keep [−atomic] exclusive plurals, no under- or overgeneration problems arise, as before. The main problem with this proposal is different: namely, that it does not constitute a real solution to the problem of inclusive plurals. This is because the rule of semantic incorporation does not per se introduce number neutrality; its semantic import follows from assumptions about the semantics of the nouns that undergo the rule. In fact, in languages where plural forms undergo morphosyntactic (pseudo)incorporation, such as Hungarian (Farkas and de Swart 2003), these forms are interpreted exclusively, not inclusively.

4.2 Replacing [−Atomic] with an Exhaustivity Operator

The basic structure of the type of account discussed in this section, developed by Mayr (2015), has the following ingredients: (a) an inclusive semantics for plural forms; (b) a predicate-level, individual-sensitive, DP-internal exhaustivity operator; and (c) constraints to regulate the distribution of (b) so that exclusive- and inclusive-plural interpretations are generated in the correct contexts. Because this type of approach essentially replaces [−atomic] with (b), the exhaustivity operator, it is in principle implementable within Harbour’s system and not subject to the same criticism that inclusive-only approaches face. The exhaustivity operator is a syntactic object, just like [−atomic]. Mayr makes crucial use of a predicate-level exhaustivity operator for generating exclusive-plural interpretations.

34 It will not do to postulate that English is a [+atomic]-only language, while Slovenian uses [±atomic] (in addition to [±minimal]). That is, it will not do to combine an inclusive-only account for some languages with an ambiguity account for others. That is because, if [+atomic]-only systems are allowed, then there should exist number systems with only one number value—namely, singular—contrary to fact. Thanks to an anonymous reviewer for raising this issue.

35 Dayal (2011, 2015) argues that Hindi plural forms that pseudoincorporate do give rise to number-neutral interpretations, but only in atelic or habitual contexts, not in telic ones. She defends an analysis in which atelicity—and not nominal number—enables number neutrality. Atelicity is not a factor in the examples we have considered here, as can be seen, for example, in the telic examples in (20), (22), and (25) for English, or (34) and (38) for Ljubljana Slovenian, all of which are cases of inclusive plurals.

English and Spanish have been argued to have syntactically restricted versions of incorporation (for weak definites in Aguilar-Guevara and Zwarts 2011, Carlson 2006, and Carlson and Sussman 2005; for implicit indefinite objects in Martí 2015; for certain Spanish and Catalan bare singulars in Espinal 2010)—but this does not explain the data we are considering.

36 Many thanks to Jacopo Romoli for suggesting this option and for discussing it with me.
Mayr’s proposal is compatible with a [+atomic] feature for morphologically singular DPs. To make comparison with earlier claims easy, we can assume that, similarly to inclusive-only accounts, we have the following denotations:\(^{37}\)

\[
\begin{align*}
(65)\ a. &\ [\text{cat}] = [\text{atomic}][\text{nP}] = \\
&\lambda x. \text{x is a cat & atom}(x) \\
(\text{singular})
\end{align*}
\]

\[
\begin{align*}
(65)\ b. &\ [\text{cats}] = [\text{nP}] = \\
&\lambda x. \text{x is a cat} \\
(\text{plural})
\end{align*}
\]

Because the denotation of the singular form is a subset of the denotation of the plural form, singular and plural stand in a scalar relation, as before. The predicative exhaustivity operator, which I call \textit{Exh-pred}, is shown in (66). It makes use of predicate alternatives (cf., e.g., Fox 2007, Ivlieva 2013, Spector 2007, Zweig 2009).

\[
(66) [\text{Exh-pred}] = \lambda f. \lambda x. f(x) = 1 \& \forall g \in \text{Alt} [f \not\subseteq g \rightarrow g(x) = 0]
\]

This operator applies to a predicate and returns true for any individual that makes that predicate true and that makes all nonweaker alternative predicates false. The fact that the denotation of plural forms (see (65b)) is weaker than the denotation of alternative, singular forms (see (65a)) is crucial in generating a plural inference in examples such as (67).

\[
(67) \text{Lina harvested tomatoes.}
\]

Mayr assumes a silent existential generalized quantifier (\textit{indef}), a distributivity operator (\textit{D}), and movement of noun phrases above \textit{D}, the latter two familiar from the literature on distributivity. With these ingredients, the following LF is generated for (67):

\[
(68) [\text{indef} [\text{Exh-pred tomatoes}]] [\text{D} [3 [\text{Lina harvested t}_3]]]
\]

Applying \textit{Exh-pred} to the nP \textit{tomatoes} (see (65b)) in (68) yields the set of nonatomic tomato individuals, since these individuals are tomato individuals and they make all nonweaker alternative predicates (i.e., the singular, atomic-sensitive \textit{tomato}; (65a)) false. This is equivalent to the effect that [−atomic] would have here. \textit{Indef} then existentially quantifies over one of these nonatomic individuals, yielding an exclusive plural reading for (67), as desired. Thus, (67) is correctly predicted to be incompatible with Lina’s having harvested just one tomato.

Like NumP in ambiguity accounts, \textit{Exh-pred} is not always generated when there is a plural form in the structure. There is a second exhaustivity operator, which I call \textit{Exh-prop} and which is propositional in nature.

\(^{37}\) Mayr (2015) assumes that plural morphology delivers the inclusive interpretation in (65b), since he assumes it corresponds to Link’s (1983) *-operator. In Harbour’s framework, such interpretations are always available as the denotation of nP, without the need for the *-operator.
(69) \[\text{Exh-prop}^w = \lambda p, q \in A \& q \in A \quad p(q(w)) = 0\]

Whichever one of Exh-prop or Exh-pred yields the strongest possible interpretation is the preferred operator in any given case. Exh-prop will be preferred in downward-entailing environments such as (70).

(70) *English*

Lina didn’t harvest tomatoes.

Exh-prop asserts a proposition and negates all nonweaker alternatives to it, in parallel fashion to Exh-pred. The LF for (70) with this operator is as follows:

(71) \[\text{Exh-prop}[[\text{indef tomatoes}] [D [3 \text{[Lina harvested t]}]]]]\]

(71) yields an inclusive plural interpretation, that Lina didn’t harvest an atomic or a nonatomic tomato—she harvested no tomato at all. This is so because (71) yields the proposition that Lina didn’t harvest any tomato at all (by virtue of the semantics of *tomatoes*, (65b)), and there is no nonweaker alternative to negate because that is already the strongest possible statement. That the strongest possible statement must be made is involved in blocking the LF in (72) for (67).

(72) \[\text{Exh-prop}[[\text{indef tomatoes}] [D [3 \text{[Lina harvested t]}]]]]\]

Exh-prop in (72) yields the proposition that Lina harvested an atomic or a nonatomic tomato (i.e., one or more tomatoes). There is no nonweaker alternative proposition to negate. This result is weaker than what (68) gives rise to and is thus blocked.\(^{38}\)

If Exh-pred is taken to do the work of \([-\text{atomic}]\) in the account of (67) and (70), then Exh-pred must also do the work of \([-\text{atomic}]\) in other places where Harbour’s system uses it—for example, in generating duals and paucals. Otherwise, we would run into the overgeneration problem discussed above for some inclusive-only accounts. For a language like Ljubljana Slovenian, this approach allows us to entertain the LFs in (74) and (75) for the sentence in (34), repeated as (73), with a plural form.

(73) *Ljubljana Slovenian*

Do danes fantom (še) nisem pomagal.

until today boy.DAT.MASC.DU/PL yet NEG.AUX.1SG help.PTC.SG

‘Until today I didn’t help boys.’

(74) \[\text{not} [[\text{indef [\text{-minimal Exh-pred boys}}]] [D [3 \text{[I helped t]}]]]]\]

(75) \[\text{Exh-prop}[[\text{indef boys}] [D [3 \text{[I helped t]}]]]]\]

(75) is the chosen representation, as desired. (74) yields the interpretation that there isn’t a plurality of three or more boys that I helped ([\text{-minimal Exh-pred boys}] denotes a set of plural individuals

\(^{38}\) Exh-prop is perhaps a solution to the problem discussed in footnote 10, but more needs to be said about its exact distribution, as Mayr (2015:215) acknowledges.
each of which consists of three or more atoms). This is weaker than the interpretation that (75) yields, that I did not help an atomic or a nonatomic boy, an inclusive interpretation, so it is blocked (see (71)). In upward-entailing contexts, the LF with Exh-pred delivers the exclusive-plural interpretation (i.e., the more-than-two-boys interpretation) (see (68)).

(76) [[indef [−minimal [Exh-pred boys]]] [D [I helped t₃]]]]

This account of exclusive- and inclusive-plural interpretations in a language with duals is very similar to the one for English given above.

In this system, we can also think of the dual as a compositionally built number value, as in Harbour’s system. The building blocks would be [+minimal] plus an additional ingredient that plays a role with plurals, namely, Exh-pred. The structure of a DP with a dual-marked noun could be as follows:

(77) gives rise to the meaning we are after for the dual: [+minimal] selects the minimal individuals, the twosomes, from an already exhaustified set (i.e., a set that does not contain atoms). I assume that both [+minimal] and Exh-pred are involved in the morphological spell-out of the dual, so that dual forms require the presence of both. This makes the right predictions for sentences in which the dual is negated, such as (35), repeated as (78).

(78) 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.’

(79) [not [indef [+minimal [Exh-pred fantoma]]] [D [I helped t₃]]]]

(79) yields the interpretation that there isn’t a duality of boys that I helped (I could have helped one, or more than two), as desired.

39 This assumption, while not attractive, corresponds to the assumption that only plural forms (not duals, paucals, etc.) can be inclusive in the ambiguity account (which is correct, as far as I know).
The question arises whether it is sensible, from Harbour’s perspective, to postulate that [−atomic] may be replaced by Exh-pred in at least some languages. Presumably, singular-plural languages without inclusive plurals would still make use of [±atomic], so the Mayr 2015–based account of the inclusive-plurals problem would need to state that either [±atomic] or [±atomic]/Exh-pred systems (and those built from these) are possible. While this state of affairs is indeed a possibility, it nevertheless constitutes a departure from the reasonable hypothesis that the features that are paired are those whose meanings are counterparts of each other (the way Harbour’s +/− valued features are).

In addition, the attachment possibilities of Exh-pred might constitute an issue. A number of attachment sites are available for Exh-pred in the structure of DP, whereas the attachment sites for [−atomic] are in principle constrained by NumP and by the semantics of [−atomic]. (80), for example, yields the wrong result for the dual, since it predicts that a DP with a dual-marked noun could be interpreted as singular, contrary to fact.

A structure like (80) but with [−atomic] instead of Exh-pred, on the other hand, correctly yields an ill-formed result, as there are no nonatoms in a set of atoms (the latter, what NumP delivers here). In number systems that also include the feature [±additive], or that allow repetition of features, additional possible attachment sites might be available, but not all of them might yield correct results. Finally, if Exh-pred is used elsewhere in the theory to generate scalar implicatures (which is the purpose of postulating exhaustivity operators in the first place), the crosslinguistic typology of number and inclusive plurals would be intimately tied to quite disparate phenomena, with potentially far-reaching consequences for language acquisition and change. In principle, this is an attractive possibility, but a possibility that needs to be properly explored.

Be this as it may, incorporating Mayr’s (2015) Exh-pred into Harbour’s theory to do the work of [−atomic] avoids, like ambiguity approaches, the under- and overgeneration problems pointed out earlier for inclusive-only accounts. That is because it is still the case that one of the ingredients of the dual (or the paucal), Exh-pred, is involved in the account of plural forms. The ambiguity of plural forms in ambiguity accounts translates in this account into the possibility of combining them either with Exh-prop (for inclusive interpretations) or with Exh-pred (for exclusive interpretations). Without Exh-pred (see, e.g., Spector 2007), it is no longer possible to compositionally build duals or paucals (since predicate-level features such as [±minimal] cannot operate
on what results from applying Exh-prop, and it is difficult to see how a system with proposition-
level number features would work); thus, the overgeneration problem of section 3.2 resurfaces.

5 Conclusion

In this article, I have defended the thesis that an account of both inclusive plurals and the crosslin-
guistic typology of grammatical number requires postulating a [−atomic] feature (or something
very much like it, such as Mayr’s (2015) Exh-pred) in the structure of exclusive-plural DPs. The
argument was divided into two main parts. First, I showed that accounts of inclusive plurals
that derive exclusive plurals without [−atomic] suffer from important under- and overgeneration
problems. I argued against two versions of the [−atomic]-less exclusive-plurals view. If languages
with inclusive plurals never make use of [−atomic], we wrongly predict that languages with
[−atomic]-based number values such as dual or paucal should not have inclusive plurals, a problem
of undergeneration. If languages with inclusive plurals use [−atomic] for some number values,
just not the plural, these accounts overgenerate with respect to the crosslinguistic typology of
number, as languages with duals or paucals and no plurals are predicted to exist, contrary to fact.
Then, I showed that accounts of inclusive plurals that postulate a [−atomic] feature or Mayr’s
predicate-level Exh-pred in the structure of exclusive-plural DPs do not face these problems.

I have focused exclusively on the semantics of bare plurals in simple contexts. However, it
is well-known that the proper explanation of the behavior of plural-marked DPs more generally
is by no means trivial (see, e.g., Mayr 2015 for an attempt to explain the behavior of definite
plural DPs, and Ivlieva 2013 and Zweig 2009 for attempts to explain dependent plurality). In my
view, the most natural next step for the line of inquiry investigated above consists in exploring
how (well) it can be integrated into the account of more complex phenomena involving plural
DPs.

The argument proposed here suggests that the accounts of seemingly fully independent
phenomena, such as the typology of grammatical number and the distribution of exclusive- and
inclusive-plural DPs, are actually intimately related.

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