Mass, non-singularity, and augmentation*

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Tsoulas' findings on the grammar of number and mass terms in Greek show that what at first appear to be redundancies in a broader program of research are in fact exploited by natural languages to real morphological and semantic effect. This commentary aims to place Tsoulas' findings in a broader theoretical context and to explain how these seeming redundancies arise and how Greek, on his account, exploits them.

1. Introduction

Redundancy and synonymy are normally understood, by Ockham's razor, to be defects in theories. However, not all redundancies are of like ilk. For instance, the number features [±singular] and [±augmented] (defined below) may be clearly distinguished in languages such as Tongan, Winnebago and Svan, that contrast inclusive/exclusive first persons. In languages, like English, that do not, such seemingly simple concepts as singularity and plurality are potentially analytically ambiguous: they may be equally well represented by [±singular] or [±augmented]. In stark terms, there might be another speaker of English whose I-grammar is identical to mine in all respects but one: whereas I mean **rock [−singular]** by *rocks*, they mean **rock [+augmented]**. Do such redundancies constitute defects, or do they provide a range of options that natural languages actually exploit?

In the pronominal domain, this question may be hard to answer. However, in previous work (Harbour, 2007), I have argued that pronominal features are not exclusive to the pronominal domain. Rather, the same number features is utilized to represent notions of countable number, collectivity, and mass, amongst other things (see also Harbour, 2006a, for connections with aspect). The previous question can therefore be modified thus: may mass nouns, say, receive different featural representations in different languages, so that, while core properties remain invariant, there is room for divergence in the morphosemantic penumbra?

Tsoulas' discovery that Greek terms for 'water', 'mud', and so on, are nonetheless true mass nouns that may bear plural morphology constitutes such a case. In particular, he demonstrates that languages may non-redundantly exploit the semantic overlap between [±singular] and [±augmented]. On his account, the plurality of count nouns is represented in Greek by [−singular], the plural-likeness of mass nouns, by [+augmented]. Because these features are distinct but, in a sense to be made precise below, semantically compatible, they may cooccur, yielding a mass noun that also bears the mark of countable plurality.

What follows, then, may be considered as conceptual background to Tsoulas' paper, attempting to link his results about Greek to the broader issues outlined above. In section 2, I lay out the motivation for the two above-mentioned

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number features and show how, under certain circumstances, they induce two different redundancies. Then, in section 3, I spell out Tsoulas' analysis in more fine-grained syntactic detail, showing what properties are predicted and how the seeming redundancies of section 2 constitute real points of parametric variation.[1]

2. Two redundancies

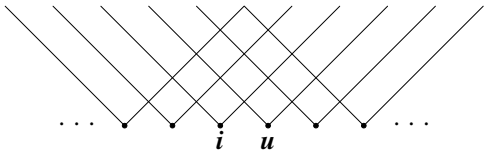
The features [±singular] and [±augmented] lead to two types of redundancy. First, if they act in the absence both of other number features and of an inclusive/exclusive contrast, then they induce the same partition, between atoms and non-atoms. Second, if they act together, then, of the two logically possible orders of semantic composition, one masks the semantic effect of one feature. This means that different featural realities may underlie what, in naive taxonomic terms, we would classify as a singular/plural distinction. Understanding the nature of these differences put us in a position to appreciate Tsoulas' findings.

Let us begin the feature definitions. (In each case, the plus value is defined and the negative value follows by negation: $[-\mathrm{F}] = \neg[+\mathrm{F}]$.)

(1) $[+\mathrm{singular}] = \lambda x\ [\mathrm{atom}(x)]$
$[+\mathrm{augmented}] = \lambda \mathrm{P}\ \lambda x{:}\mathrm{P}(x)\ \exists y\ [\mathrm{P}(y) \wedge y \sqsubset x]$

In brief, [±singular] partitions sets into atomic [+singular] versus non-atomic [−singular] elements, whereas [±augmented] partitions sets into elements that have a subelement satisfying a given property P [+augmented] and those that have no such subelement [−augmented].[2]

Consider the lattice below (technically, it is intended as a join-complete atomic semi-lattice, but it is graphically simplified and so join-completeness is not represented). In order to represent pronominal elements, two of the atoms are specially labeled as ***i*** and ***u***, respectively, the speaker and hearer. All other atoms are third persons (these are referred to below as *o*).



To simplify matters, I will not use person features here (see Harbour, 2006b, for a specific proposal), but adopt instead a superscript notation:

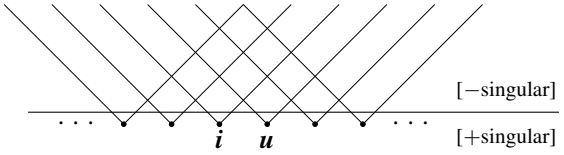
(2) x, any element of the lattice not containing ***i*** or ***u***
$x^{\boldsymbol{i}}$, any element of the lattice containing ***i*** (and possibly ***u*** and others)
$x^{\boldsymbol{u}}$, any element of the lattice containing ***u*** (and possibly others), but not ***i***
$x^{\boldsymbol{iu}}$, any element of the lattice containing both ***i*** and ***u*** (and possibly others)

[1] I confine my comments to Tsoulas' treatment of Greek. I am not entirely in agreement with the approach taken to Welsh, for which I believe that unaltered application of the structures motivated for collective nouns in Kiowa is more appropriate (see my 2007 discussion of so-called IDP nouns). I also draw attention to Acquaviva's recent book for its valuable discussion of plurality both in Celtic.

[2] For reasons not directly relevant here, 'P(x)' in the definition of [+augmented] is represented as a presupposition, where previously (cf Tsoulas' (44b)), it was represented as part of the truth conditions.

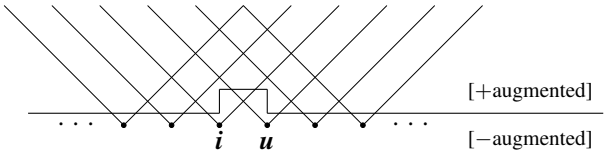
Furthermore, as just implied, I adopt the shorthand *ab* for the join $a \sqcup b$. Let us now consider the effect of each of the number features on this lattice.

The feature [±singular] induces the following partition (irrespective of whether the language has an inclusive/exclusive distinction):



Informally, [+singular] applied to $x^{\boldsymbol{i}}$, say, asks for any atom containing the speaker, a property which only the speaker alone satisfies: [+singular]($x^{\boldsymbol{i}}$) = {***i***}. On the other hand, [−singular] applied to $x^{\boldsymbol{i}}$ picks out the set of non-atomic elements containing ***i***. Informally, it asks for any non-atom containing the speaker: [−singular]($x^{\boldsymbol{i}}$) = {***io***, ***io′***, ***ioo′***, ...}.

The feature [±augmented] induces the following partition (in a language with an inclusive/exclusive distinction):



Informally, [+augmented] applied to $x^{\boldsymbol{i}}$ asks for any element that has a subelement that also satisfies (the feature specification of) $x^{\boldsymbol{i}}$. Now, this holds for any element that contains ***i*** and some other atom(s). For instance, ***i***$o(o')$ satisfies $x^{\boldsymbol{i}}$ and, moreover, contains the subelement ***i***(o'), which also satisfies $x^{\boldsymbol{i}}$. Hence, [+augmented]($x^{\boldsymbol{i}}$) = {***io***, ***io′***, ***ioo′***, ...}. On the other hand, [−augmented]($x^{\boldsymbol{i}}$) = {***i***}, as this is the only element containing ***i*** without subelements containing ***i***.

Observe the following two equivalences:

(3) [+augmented]($x^{\boldsymbol{i}}$) = [−singular]($x^{\boldsymbol{i}}$)
[−augmented]($x^{\boldsymbol{i}}$) = [+singular]($x^{\boldsymbol{i}}$)

Analogues hold for the second and third persons. In fact, the only person specification for which these number features come apart is the first inclusive. The specification [+singular]($x^{\boldsymbol{iu}}$) is contradictory, as nothing containing both ***i*** and ***u*** can be atomic; so, [−singular]($x^{\boldsymbol{iu}}$) = {***iu***, ***iuo***, ***iuo′***, ***iuoo′***, ...}. On the other hand, [+augmented]($x^{\boldsymbol{iu}}$) = {***iuo***, ***iuo′***, ***iuoo′***, ...}, as all and only the elements in the latter set have subelements that contain ***iu***; by contrast [−augmented]($x^{\boldsymbol{iu}}$) = {***iu***}. This difference explains the kink in the [±augmented] lattice and its absence from the [±singular] lattice.

In virtue of (3), however, we are able to state the first type of redundancy that these number features create:

(4) *Redundancy I*
The number systems of languages with an atomic/non-atomic contrast for countable nominals but without an inclusive/exclusive distinction may be equally well described by either [±singular] or [±augmented]

(Note that the coverage of (4) has been broadened to include normal count nouns, like *rock*, as they behave like third person pronouns in the relevant respects.)

(By way of illustration of the two systems, consider Svan and Winnebago. Both operate an inclusive/exclusive distinction, but Svan treats the speaker-hearer dyad on a par with all other non-atoms, whereas Winnebago treats it on a par with all other atoms. Observe that both languages possess affixes that attach to singular/minimal non-third persons to yield the plural/augmented: *-d* for Svan, *-wi* for Winnebago.

(5) *Upper Svan Affixes*

	Singular	Plural	
1IN	—	l-	-d
1EX	xw-	xw-	-d
2	x-	x-	-d
3	*var.*		-x

Tuite, 1995:10

Winnebago Affixes

	Minimal	Augmented	
1IN	hin-	hin-	-wi
1EX	ha-	ha-	-wi
2	ra-	ra-	-wi
3	∅	∅-	-ire

Noyer, 1992:194

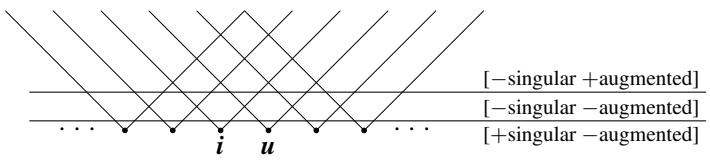
Therefore, Svan uses the feature [±singular] and has *-d* ⇔ [−singular] for non-third persons, and Winnebago uses the feature [±augmented] and has *-wi* ⇔ [+augmented] for non-third persons.)

Let us now turn to the second redundancy. Hale (1973) and Silverstein (1976) independently argued that the dual in languages with singular/dual/plural number systems is not a feature in its own right, but is featurally complex, sharing part of its specification with the singular, part with the plural. A major insight into the workings of number features (Noyer, 1992) is that the features independently motivated above provide exactly the decomposition required:

(6)

Number	Features
singular	[+singular −augmented]
dual	[−singular −augmented]
plural	[−singular +augmented]

Phrased informally (see Harbour, 2007:113–115, for formal details), these feature bundles may be understood as follows. Anything atomic is [+singular] and also [−augmented]; hence [+singular −augmented] corresponds to the singular. Everything else is non-atomic and so [−singular]. However, it is possible to distinguish between non-atomic elements with *versus* without non-atomic subelements, that is, between [+augmented] and [−augmented] pluralities. The only subelements of dyads are singletons; but triads, tetrads or larger pluralities will always have dyads, at least, as subelements. Therefore, dyads are non-singular elements without non-singular subelements, but other pluralities are non-singular elements with non-singular subelements. Thus, [−singular −augmented] corresponds to the dual, [−singular +augmented] to the plural. Graphically, in sum:



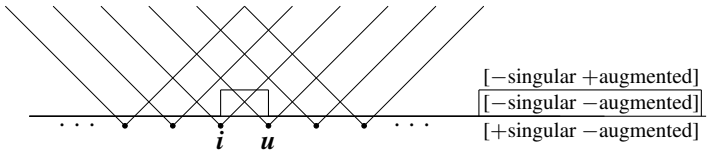
(Such a language is Tongan, though I omit examples.)

Notice, however, that the previous paragraph made a subtle assumption concerning the order of semantic composition: [±singular] applies first to partition the lattice into atomic *versus* non-atomic regions, and [±augmented] applies second, further subdividing the non-atomic region.

(7) [±singular ±augmented] = [±augmented]([±singular])

It is, however, legitimate to ask what would happen if the features applied in the reserve order.

The answer is that [±singular] becomes redundant, as represented below:



The only difference between this system and that resulting from [±augmented] alone lies in the status of the speaker hearer dyad. In the simpler feature system, the dyad is part of the same number class as the minimal first, second and third person; in the more complex feature system it is not. However, this does not provide the grammar with any new categories, because person already provides criteria for distinguishing first inclusive from other persons. In other words, at the superficial level of paradigmatic distinctions, activating both number features but reversing the order of composition in (7) yields the same system as one with [±singular] at all.

We can therefore state a second redundancy:

(8) *Redundancy II*
If both [±singular] and [±augmented] are active in a language, they must compose in the order [±augmented]([±singular]), or else [±singular] is semantically redundant

Methodologically, Redundancies I–II create a quandary: do they represent shortcomings of theory, leaving such basic taxonomic concepts as singular/plural underdetermined—essentially, a language like English could generate its number system in three distinct ways, via [±singular], or via [±augmented], or via both, composing them in the order just given—or do they represent the real range of variation that languages may non-trivially exploit? One can answer this question at either theoretically or empirically. In the theoretical level, it is clear, from languages like Svan and Winnebago, and from featurally composite natural of the dual, that something very much like the features motivated above is required in the theory of Universal Grammar. So, if they do, at times, empirically collapse, then we simply have to acknowledge that extensionally equivalent I-grammars can indeed diverge at the featural level, as outlined in the introduction. However, at the empirical level, one can imagine that subtle evidence from nominal domains may show that natural languages do, in some cases, exploit the range of variation that the theory permits. Tsoulas makes a good case that Greek is one such language.

3. Greek mass nouns

Tsoulas's paper makes three substantial observations:

(9) a. 'Water', 'mud', and so on are mass nouns in Greek.
b. 'Water', 'mud', and so on are pluralizable in Greek.
c. Mass noun pluralization is not possible in all circumstances.

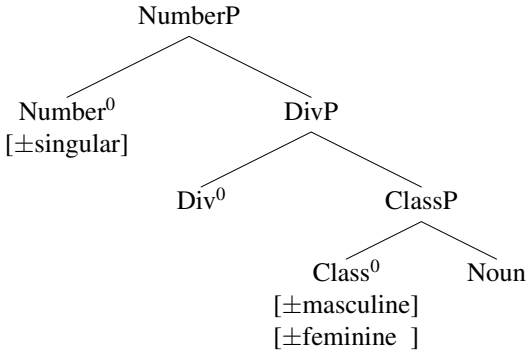
Let us momentarily leave aside the nature of restriction (c) and focus on (a)–(b).

As Tsoulas' literature review points out, the semantics of plural morphology has been variously conceived of: if a root noun denotes a join-complete atomic semi-lattice, then the plural is a function that rules out the atomic stratum; or, if a root noun denotes a set of atoms, then the plural is a function that generates the set of pluralities of those atoms. In either case, plural morphology on mass nouns is unexpected because the corresponding lattices lack atoms, meaning that there are no atoms for the plural to rule out or generate pluralities from.[3]

Tsoulas' solution to this strange situation is to claim that Greek avails itself of two number features, which it puts to different uses: [±singular] is used for count nouns, [±augmented] for mass nouns. The question then arises as to why Greek does not have a singular/dual/plural number system, like Tongan, given that it activates both features in the nominal domain. The answer depends on the the syntactic distribution of the features. To create a dual, [±augmented] must compose with [±singular] (either before or after that feature has composed with the root noun). This is achieved by collocating both features under Number^0. In Greek, the features are distributed differently, as described below.

For count nouns, let us posit the following structure (combining ideas from Borer, 2005, and Harbour, 2007):

(10)



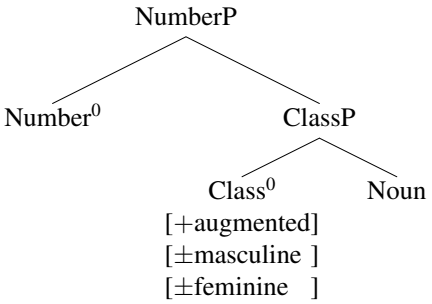
Here, Number^0 is the locus of [±singular] for the singular/plural distinction (the specifier position is reserved for numerals); Div^0 is the locus of information about

[3]Tsoulas makes brief mention (in his section 2.3) of such mass nouns 'furniture', 'cutlery', 'silverware', which challenge the view that lack of atomlessness is a defining trait of masshood—after all, if a table is a well defined atom of 'table(x)', and if tables are furniture, then why is a table not also an atom of 'furniture(x)'? A reasonable hypothesis to pursue might be that the predicates 'table(x)' and 'furniture(x)' differ with respect to uniformity of atoms: any atom satisfying 'table(x)' is a table, but not every atom satisfying 'furniture(x)' is. In this sense, such mass nouns are similar to pluralia tantum nouns, like 'trousers', 'scissors', 'glasses', which constitute plurals of heterogeneous parts. The two differ in that there is a natural notion of unithood for pluralia tantum nouns that is unavailable for mass nouns comprised by heterogeneous atoms.

division of the nominal into countable units (the specifier position is reserved for classifier-like elements); Class^0 is the locus of the gender features. (Not much significance is attached to the names of these projections: one could identify Noun as a bare root and Class as the categorial *n* of Marantz (1997) and Kihm (2005).)

For mass nouns, we have:

(11)



There are two important differences between (10) and (11), concerning DivP and the content of Class^0. First, as Tsoulas' suggests, mass nouns have an extra class feature, [+augmented], encoding that they denote a different kind of lattice from count nouns, one in which "it's turtles all the way down": subelements of elements still satisfy the nominal predicate (Link, 1983; see Tsoulas' section 3.1). (Note that this exploits Redundancy I (4), in that the plural-likeness of mass nouns is captured by [+augmented] rather than by the count noun plural [−singular].) Second, mass nouns are assumed to lack DivP, corresponding to their lack of countable units. This may be regarded as a consequence of the previous point.

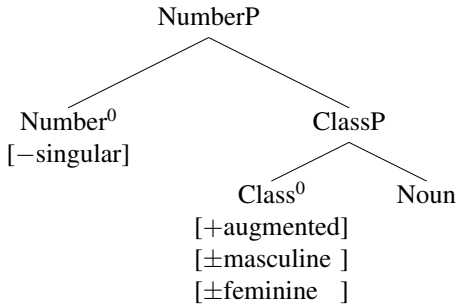
Now, (11) represents a departure from the structure I had previously assumed for mass nouns, but the departure is crucial for Tsoulas' treatment of pluralized mass nouns in Greek. Like Borer, I had assumed (2007) that mass have less functional structure than count nouns. Having posited only NumberP and ClassP, I could deprive mass nouns only of NumberP. However, if Borer is correct in positing the specifier of NumberP as the locus for mass quantifiers such as *much*, *little*, and so on, then this projection cannot be systematically absent in mass nouns. The structure in (10) permits one to omit DivP for mass nouns, whilst retaining the syntactic locus of *many*, *little* and so on.

This put us in a position to spell out Tsoulas' explanations of his three generalizations. For normal count nouns, differences like *to milo* 'the apple' / *ta mila* 'the apples', and corresponding differences in verbs *vrazi* 'boils' / *vrazun* 'boil', can be analyzed in two ways: either pairs like *-o*/*-a* and *-i*/*-un* are taken to realize [+singular]/[−singular]; or else the singular form is taken to be the default, so that affixes like nominal *-o* and verbal *-i* are regarded as exponents only of gender and person, with affixes like nominal *-a* and verbal *-un* taken to realize [−singular]. In order to capture the crosslinguistically common (though not universal) fact that mass nouns occur with singular nominal and verbal affixes (as in Tsoulas' (14)), we must assume the second position, namely that the singular forms are defaults. The reason for this is that the syntactic structure assumed for mass nouns (11) lacks the feature [+singular] (nor does it make sense to revise (11) so as to include [+singular], as this would be tantamount to claiming, contra Link 1983, that the lattice structure for mass nouns contains atoms). Adopting

this view of the syntactic structure of mass nouns and the origin of their singular nominal and verbal endings brings the Greek terms for 'water', 'mud', and so on in line with traditional treatments of mass nouns and therefore captures (9a).

Two questions now arise concerning the pluralization of mass nouns: how it is syntactically possible, and what its semantic effect is. In answer to the former (9b), Tsoulas suggests that [−singular] is optionally permitted with mass nouns in Greek (as a matter, one presumes, of parametric variation):

(12)



This is very natural, given the theory adopted above. First, the usual syntactic locus of [−singular], namely Number^0, is present in (12). Second, the occurrence of [−singular] on a mass noun does not affect its denotation, for two reasons: the feature asserts non-atomicity, which mass nouns trivially satisfy; and as NumberP dominates ClassP, the order of composition, [−singular]([+augmented Noun]) does not, by Redundancy II, unduly constrain the denotation of the mass noun.

Concerning the semantic of effect of the addition of [−singular] to (11), the previous paragraph has already asserted that, in truth conditional terms, the feature is redundant. However, in morphological terms, its presence is obvious, as vocabulary items are available in both nominal and verbal domains to signal it. Any person hearing it, then, is led to a classic piece of Gricean reasoning: what extra information could the speaker intend, that could not have been communicated without [−singular]? Since these vocabulary items ordinarily indicate an increase in quantity, the same effect, the hearer deduces, is encoded by [−singular] on mass nouns. This is precisely Tsoulas' point in his section 4.1: pluralization contributes a quantity implicature. Note, importantly, that both the increased quantity and the fact that it is an implicature are naturally derived on this approach.[4]

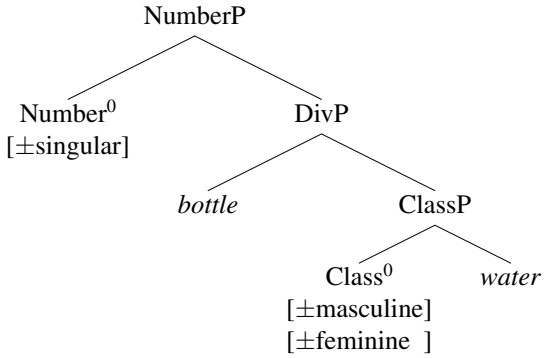
These comments on the nature of the meaning of pluralization on mass nouns already go some of the way to explaining (9c), the restrictions on when mass nouns may be pluralized. Tsoulas notes two other circumstances (beyond lexical idiosyncrasy), to which we now turn.

The first is that mass nouns are not pluralizable when measured in standard quantities. Hence, one cannot order **two bottles of waters* (his (25)), though it is possible for one's ceiling to be invaded by *three tankfuls of waters* (his (27)). It is straightforward to explain these restrictions given the account so far. Let us assume that regular portion measures, like *bottle*, are located, with classifiers,

[4]The fact that the contribution of [−singular] arises by implicature, not by direct computation of truth conditions, may help to explain its apparent crosslinguistic rarity. If it fell out naturally from the semantic apparatus alone, one might expect many languages to avail themselves of it. However, if its meaning requires pragmatic conventionalization, then it might reasonably be rarer.

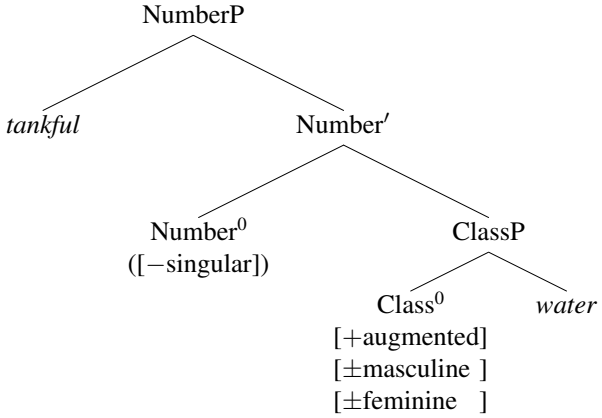
in the specifier of DivP, but that irregular measures, particularly those, like *tankful*, that denote large quantities, are located, with *many/much*, in the specifier of NumberP. So, for *bottles of water*, we have:

(13)



Notice that the measure *bottle* intervenes between [−singular], that is, what will emerge as the nominal plural, and the head noun *water*. So, only *bottle* may be pluralized in this configuration, not *water*. For *tankful of waters*, we have (leaving aside whether DivP is present in these cases):

(14)



Here, the quantity phrase *tankful* does not intervene between Number^0 and *water*, so, if [−singular] is present, it will be expressed as pluralization of the head noun, as desired.[5,6]

Lastly, consider such cases as *Water boils at 100°*, the second circumstance in which Tsoulas notes that pluralization of *water* is impossible. His suggestion (though it is not developed into a full explanation) is that non-episodic

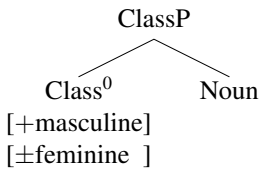
[5]In order to capture that the quantity phrase itself may be pluralized and/or cooccur with other quantity phrases, as in ***three*** *tankful-**s** of waters*, I suggest that Number projects a second time, either along the functional spine of the noun phrase, or on its specifier:

(i) a. [***NumP*** three [***Num*** -s [*NumP* tankful [*Num* -s [water]]]]]
b. [*NumP* [***NumP*** three [***Num*** -s [tankful]]] [*Num* -s [water]]]

[6]This phrase structure predicts that plurality should have the same import in such phrases as *three tankfuls of waters*, namely quantity implicature, as it has in the more basic structures discussed above.

readings are incompatible with plural mass nouns. An alternative explanation—consistent at least with his examples—is that the deviant cases involve reference to kinds. Although there is no explicit exponent of 'water' *qua* mass noun and 'water' *qua* kind, it is reasonable to assume that they are semantically different and that this difference is reflected in the syntax. Mass nouns may be referred to in quantities and sub/super-quantities; they are, in consequence, modeled by lattices. Kinds may only be referred to as an undifferentiated whole. I suggest, therefore, that they form, at most, trivial lattices, consisting of a single element. This means that NumberP is not a semantically apt projection for kind terms, so that kinds have an even smaller functional structure than mass nouns, namely, the root noun and class only (without [+augmented]):

(15)



Without NumberP, there is no locus for [−singular], nor, therefore, for any plural morphemes (only the default singular can occur). This not only captures Tsoulas' observation, but also captures that specifiers of NumberP, such as *much/little*, cannot occur with kind terms (which is all but criterial for these items).

4. Conclusion

In this commentary, I have attempted to place Tsoulas' discoveries concerning optionally pluralizable mass nouns in Greek in the context of a broader project of investigation into the syntax and semantics of number features. In particular, I have upheld Tsoulas' core claim (with minor revisions as to implementation) that Greek represents the plural-likeness of mass nouns with [+augmented], but uses [−singular] for true pluralities of count nouns, and I have shown that this underlines an important point in the more general theory of number features: that what appear to be analytic redundancies in feature definition and composition can in fact be exploited by natural languages. If this is so, then it suggests that the broader line of inquiry is on the right track.

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