Appendix A The implicature approach in more detail

A.1 Spector (2007)

Recall that under Spector's (2007) approach, the multiplicity inference of (1) arises as a higher-order/recursive scalar implicature through competition with the singular alternative (2) enriched with its own scalar implicature, effectively making it equivalent to (3).

(1) The tiger fed pigs.
$\rightsquigarrow$ *The tiger more than one pig*

(2) The tiger fed a pig.

(3) The tiger fed exactly one pig.

According to Spector, (3) comes about when (2) is compared to (4), giving rise to the enriched meaning in (5).

(4) The tiger fed (at least) two pigs.

(5) The tiger fed a pig and it is not true that he fed (at least) two pigs =
The tiger fed exactly one pig.

(1) is then compared to (5), leading to the negation of (5) and the resulting meaning in (6).

(6) The tiger fed pigs and it's not true that he fed exactly one pig. =
The tiger fed more than one pig.

More schematically, let SG stand for (2), PL for (1) and TWO for (4). The basic assumptions are outlined below:

(7) $\text{SG} = \text{PL}$ singular and plural are equivalent

(8) $\text{TWO} \Rightarrow \text{SG}/\text{PL}$ (at least) two entails both singular and plural

(9) $\langle \text{SG}, \text{TWO} \rangle$ (at least) two is an alternative of the singular

(10) $\langle \text{SG}, \text{PL} \rangle$ the singular and the plural are alternatives

For concreteness, assume also that implicatures come about via the exhaustification process exh (Fox 2007; Chierchia et al. 2012, among many others).[1] The exhaus-

[1] Note however that any theory that allows implicatures to be recursive would work here.

tivity operator exh is defined in (11), where $ALT(\phi)$ is the set of alternatives to ψ and $\text{EXCL}(\phi, Alt(X))$ is the set of excludable alternatives to ϕ.

(11) $[\![\text{EXH}\phi]\!](w) = [\![\phi]\!](w) \wedge \forall \psi \in \text{EXCL}(\phi, ALT(\phi))[\neg[\![\psi]\!](w)]$

An alternative is excludable if its negation does not contradict the literal meaning of the asserted sentence and does not lead to the truth of any other alternative in the set, as indicated in the definition in (12):[2,3]

(12) $\text{EXCL}(\phi, X) = \{\psi \in X : [\![\phi]\!] \not\subseteq [\![\psi]\!] \wedge \neg\exists\chi[\chi \in X \wedge ([\![\phi]\!] \wedge \neg[\![\psi]\!]) \subseteq [\![\chi]\!]]\}$

Now we can show the following:

(13) $\text{exh}(\text{PL}) = \text{PL}$ the alternative SG can't be negated

(14) $\text{exh}(\text{SG}) = \text{SG} \wedge \neg\text{TWO}$ the enriched meaning of the singular

(15) $\text{exh}(\text{exh}(\text{PL})) = \text{PL} \wedge \neg(\text{SG} \wedge \neg\text{TWO}) = \text{TWO}$
the plural and the negation of the enriched singular = multiplicity inference

Thus the derivation of (16), over the set of alternatives in (17) and (18), is as given below (where the alternatives for exh(SG) are {SG, TWO}).

(16) $\text{exh}_1[\text{exh}_2[\text{PL}]] = \text{PL} \wedge \neg(\text{SG} \wedge \neg\text{TWO}) = \text{TWO}$

(17) $\text{Alt}_2 = \{\text{PL}, \text{SG}\}$

(18) $\text{Alt}_1 = \left\{ \begin{array}{l} \text{exh}_2(\text{PL}) = \text{PL} \\ \text{exh}_2(\text{SG}) = \text{SG} \wedge \neg\text{TWO} \end{array} \right\}$

A.2 Kane et al. (2015)

Kane et al. (2015) extend Spector's (2007) analysis of the multiplicity inference to the abundance inference in (19), triggered by pluralised mass nouns:

(19) Tis zebras tis epesan zahar-es.
DEF.FEM.SG.DAT zebra CL.FEM.SG.DAT fell.3PL sugar-PL
'The zebra dropped sugar.'
$\rightsquigarrow$ *The zebra dropped a lot of sugar.*

As with the multiplicity inference, the abundance inference arises as a higher-order/recursive scalar implicature. It comes about through competition with (20)

[2] Spector (2007) employs a different version of exh using minimal worlds, but for our purposes nothing hinges on the particular definition of exh; see Spector (2016) for a comparison between the two exh's.

[3] Note that this is not the final version of exh provided in Fox (2007), but it suffices for our purposes.

enriched with its own scalar implicature, which effectively makes it equivalent to (21).

(20) Tis zebras tis epese zahar-i.
DEF.FEM.SG.DAT zebra CL.FEM.SG.DAT fall sugar-SG
'The zebra dropped sugar.'

(21) The zebra dropped some sugar but not a lot.

(21) arises because (20) is compared to (22), giving rise to the enriched meaning in (23).

(22) The zebra dropped a lot of sugar.

(23) The zebra dropped a little or more than a little sugar and it is not true that she dropped a lot of sugar =
The zebra dropped some sugar but not a lot.

Subsequently, (19) competes with (23), leading to the negation of (23) and giving rise to the meaning in (24).

(24) The zebra dropped a little or more than a little sugar and it's not true that she dropped some sugar but not a lot. =
The zebra dropped a lot of sugar.

In a more schematic way, let SG_M stand for (20), PL_M for (19) and A LOT for (22). The basic assumptions are outlined below:

(25) $\text{SG}_M = \text{PL}_M$ singular and plural are equivalent

(26) $\text{A LOT} \Rightarrow \text{SG}_M/\text{PL}_M$ a lot entails both singular and plural

(27) $\langle \text{SG}_M, > \text{A LOT} \rangle$ a lot is an alternative of the singular

(28) $\langle \text{SG}_M, \text{PL}_M \rangle$ the singular and the plural are alternatives

Finally, the definition of the exhaustivity operator exh and excludable alternatives are defined as in the count domain (see definitions in (11) and (12)). Now, we have:

(29) $\text{exh}(\text{PL}_M) = \text{PL}_M$ the alternative SG can't be negated

(30) $\text{exh}(\text{SG}_M) = \text{SG}_M \wedge \neg \text{A LOT}$ the enriched meaning of the singular

(31) $\text{exh}(\text{exh}(\text{PL}_M)) = \text{PL} \wedge \neg(\text{SG}_M \wedge \neg \text{A LOT}) = \text{A LOT}$
the plural and the negation of the enriched singular = abundance inference

Therefore the derivation of (32), over the set of alternatives in (33) and (34), is as provided below (where the alternatives for EXH(SG) are {SG, A LOT}).

(32) $\text{exh}_1[\text{exh}_2[\text{PL}_M]] = \text{PL}_M \wedge \neg(\text{SG}_M \wedge \neg\text{A LOT}) = \text{A LOT}$

(33) $\text{Alt}_2 = \{\text{PL}_M, \text{SG}_M\}$

(34) $\text{Alt}_1 = \left\{ \begin{array}{l} \text{exh}_2(\text{PL}_M) = \text{PL}_M \\ \text{exh}_2(\text{SG}_M) = \text{SG}_M \wedge \neg\text{A LOT} \end{array} \right\}$

Appendix B Experimental materials

B.1 Count Nouns — target trials

B.1.1 Positive trials

(35) I tighri taise ghurunia!
DEF.FEM.SG.NOM tiger fed pig.PL
'The tiger fed pigs!'

(36) I zebra mazepse bananes!
DEF.FEM.SG.NOM zebra picked banana.PL
'The zebra picked bananas!'

(37) To kuneli evapse kithares!
DEF.NEUT.SG.NOM bunny painted guitar.PL
'The bunny painted guitars!'

B.1.2 Negative trials

(38) O vatrahos dhen taise pulakia!
DEF.MASC.SG.NOM frog NEG fed bird.PL
'The frog didn't feed birds!'

(39) To kanguro dhe mazepse ahladhia!
DEF.NEUT.SG.NOM kangaroo NEG picked pear.PL
'The kangaroo didn't pick pears!'

(40) To liontari dhen evapse kupes!
DEF.NEUT.SG.NOM lion NEG painted cups.PL
'The lion didn't paint bowls!'

B.2 Mass nouns — target trials

B.2.1 Positive trials

(41) I tighri pire nera!
DEF.FEM.SG.NOM tiger took water.PL
'The tiger took water!'

(42) Tis zebras tis epesan zahares!
DEF.FEM.SG.DAT zebra CL.FEM.SG.DAT fell.3PL sugar.PL
'The zebra dropped sugar!'

(43) To kunelaki aghorase psomia!
DEF.NEUT.SG.NOM bunny bought bread.PL
'The bunny bought bread!'

B.2.2 Negative trials

(44) O vatrahos dhen pire hionia!
DEF.MASC.SG.NOM frog NEG took snow.PL
'The frog didn't take snow!'

(45) Tu kanguro dhen tu epesan alevria!
DEF.NEUT.SG.DAT kangaroo NEG CL.NEUT.SC.DAT fell.3PL flour.PL
'The kangaroo didn't spread flour!'

(46) To liontaraki dhen aghorase kreata!
DEF.NEUT.SG.NOM lion NEG bought meat.PL
'The lion didn't buy meat!'

B.3 Count nouns — plural controls

(47) I kamilopardhali kuvalise karpuzia!
DEF.FEM.SG.NOM girraffe carried watermelon.PL
'The giraffe carried watermelons!'

(48) I kota taise ghates!
DEF.FEM.SG.NOM chicken fed cat.PL
'The chicken fed cats!'

(49) To provato dhen kuvalise karota!
DEF.NEUT.SG.NOM sheep NEG carried carrot.PL
'The sheep didn't carry carrots!'

(50) I tighri dhen taise pontikia!
DEF.FEM.SG.NOM tiger NEG fed mouse.PL
'The tiger didn't feed mice!'

B.4 Mass nouns — plural controls

(51) I kamilopardhali erikse kato ghalata!
DEF.FEM.SG.NOM giraffe dropped down milk.PL
'The giraffe dropped milk!'

(52) I kota aghorase tsimeda!
DEF.FEM.SG.NOM chicken bought cement.PL
'The chicken bought cement!'

(53) 'To provato erikse kato laspes!'
DEF.NEUT.SG.NOM sheep dropped down mud.PL
'The sheep dropped mud!'

(54) I tighri dhen aghorase ifasmata!
DEF.FEM.SG.NOM tiger NEG bought fabric.PL
'The tiger didn't buy textile!'

B.5 Negation controls

(55) a. I zebra dhen evapse tis kupes!
DEF.FEM.SG.NOM zebra NEG painted DEF.FEM.PL.ACC mug.PL
'The zebra didn't paint the mugs!'
b. I zebra dhen evapse ta vaza!
DEF.FEM.SG.NOM zebra NEG painted DEF.NEUT.PL.ACC vase.PL
'The zebra didn't paint the vases!'

(56) a. To kuneli dhen kuvalise ta trapezia!
DEF.NEUT.SG.NOM bunny NEG carried DEF.NEUT.PL.ACC table.PL
'The bunny didn't carry the tables!'
b. To kuneli dhen kuvalise tis karekles!
DEF.NEUT.SG.NOM bunny NEG carried DEF.FEM.PL.ACC chair.PL
'The bunny didn't carry the chairs!'

(57) a. O vatrahos dhen evapse tis kardhies!
DEF.MASC.SG.NOM frog NEG painted DEF.FEM.PL.ACC heart.PL
'The frog didn't paint the hearts!'
b. O vatrahos dhen evapse ta asteria!
DEF.MASC.SG.NOM frog NEG painted DEF.NEUT.PL.ACC star.PL
'The frog didn't paint the stars!'

(58) a. To kanguro dhen kuvalise ta spitia!
DEF.NEUT.SG.NOM kangaroo NEG carried DEF.NEUT.PL.ACC house.PL
'The kangaroo didn't carry the houses!'
b. To kanguro dhen kuvalise ta kutia!
DEF.NEUT.SG.NOM kangaroo NEG carried DEF.NEUT.PL.ACC box.PL
'The kangaroo didn't carry the boxes!'

B.6 Scalar implicatures

(59) To liontaraki kuvalise merika apo ta mila!
DEF.NEUT.SG.NOM lion carried SOME of DEF.NEUT.PL.ACC apples
'The lion carried some of the apples!'

(60) I kamilopardhali evapse merika apo ta amaksia!
DEF.FEM.SG.NOM giraffe painted SOME of DEF.NEUT.PL.ACC car.PL
'The giraffe painted some of the cars!'

(61) I kota taise merikes apo tis pashalitses!
DEF.FEM.SG.NOM chicken fed SOME of DEF.FEM.PL.ACC ladybug.PL
'The chicken fed some of the ladybugs!'

(62) To provato kuvalise merika apo ta plia!
DEF.NEUT.SG.NOM sheep carried SOME of DEF.NEUT.PL.ACC ship.PL
'The sheep carried some of the ships!'

References

Chierchia, Gennaro, Danny Fox & Benjamin Spector. 2012. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning*, vol. 3, 2297–2332. Berlin: Mouton de Gruyter.

Fox, Danny. 2007. Free choice and the theory of scalar implicatures. In Uli Sauerland & Penka Stateva (eds.), *Presupposition and Implicature in Compositional Semantics*, 71–120. Palgrave.

Kane, Frances, George Tsoulas, Raffaella Folli, Theodora Alexopoulou & Jacopo Romoli. 2015. A scalar implicature-based account of the inference of pluralized mass (and count) nouns. In *Proceedings of 51st Meeting of the Chicago Linguistic Society (CLS)*. 317–331.

Spector, Benjamin. 2007. Aspects of the pragmatics of plural morphology: On higher-order implicatures. In Uli Sauerland & Penka Stateva (eds.), *Presupposition and implicature in compositional semantics*, London: Palgrave Macmillan.

Spector, Benjamin. 2016. Comparing exhaustivity operators. *Semantics & Pragmatics* 9(11). 1–33. http://dx.doi.org/10.3765/sp.9.11.