Research Article

Does *Kaniso* Activate *CASINO*?

Input Coding Schemes and Phonology in Visual-Word Recognition

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Abstract. Most recent input coding schemes in visual-word recognition assume that letter position coding is orthographic rather than phonological in nature (e.g., SOLAR, open-bigram, SERIOL, and overlap). This assumption has been drawn – in part – by the fact that the transposed-letter effect (e.g., *caniso* activates *CASINO*) seems to be (mostly) insensitive to phonological manipulations (e.g., Perea & Carreiras, 2006, 2008; Perea & Pérez, 2009). However, one could argue that the lack of a phonological effect in prior research was due to the fact that the manipulation always occurred in internal letter positions – note that phonological effects tend to be stronger for the initial syllable (Carreiras, Ferrand, Grainger, & Perea, 2005). To reexamine this issue, we conducted a masked priming lexical decision experiment in which we compared the priming effect for transposed-letter pairs (e.g., *caniso-CASINO* vs. *caviro-CASINO*) and for pseudohomophone transposed-letter pairs (*kaniso-CASINO* vs. *kaviro-CASINO*). Results showed a transposed-letter priming effect for the correctly spelled pairs, but not for the pseudohomophone pairs. This is consistent with the view that letter position coding is (primarily) orthographic in nature.

Keywords: transposed-letter effect, letter position coding, phonological computation, serial activation

In the past years, there has been growing interest in how letter positions are encoded within a word. One of the most examined (and replicated) findings has been the so-called transposed-letter effect: a transposed-letter nonword such as *cholocate* is more perceptually similar to the word *chocolate* than the orthographic control nonword *chotonate* (e.g., see Grainger & Whitney, 2004; Johnson, Perea, & Rayner, 2007; Perea & Lupker, 2004; Rayner, White, Johnson, & Liversedge, 2006). This robust finding poses some obvious problems for position-specific ("slot") coding schemes (interactive-activation model, McClelland & Rumelhart, 1981; multiple read-out model, Grainger & Jacobs, 1996; Dual Route Cascaded model, Coltheart, Rastle, Conrad, Langdon, & Ziegler, 2001). Note that in a position-specific coding scheme, both *cholocate* and *chotonate* are equally similar to *chocolate*. For that reason, in the past years, several input coding schemes have been proposed that can readily capture the transposed-letter effect (SOLAR model, Davis, 1999; SERIOL model, Whitney, 2001; open-bigram model, Grainger & van Heuven, 2003; overlap model, Gómez, Ratcliff, & Perea, 2008).

One limitation of these new input coding schemes is that, in their current version (see Davis, 2006), they focus on orthography rather than phonology – indeed, only the SERIOL model includes a phonological module. One reason why the recently proposed input coding schemes have not specified in detail the role of phonology is that the empirical evidence concerning phonological influences in letter position coding is very scarce. For instance, in a masked priming lexical decision task, Perea and Carreiras (2006) found a significant advantage of the transposed-letter priming condition (*relovución-REVOLUCIÓN*) relative to both a pseudohomophone transposed-letter condition (*relobución-REVOLUCIÓN*; note that *b* and *v* are pronounced /b/ in Spanish) and an orthographic control *reloducíón-REVOLUCIÓN*, while there was virtually no difference between the phonological and the orthographic conditions. Likewise, Perea and Carreiras (2008) found that the magnitude of the masked transposed-letter priming effect was similar when the transposed-letter prime involved a change in phonology (*racidal-RADICAL*, the rule-based letter *c* in the prime has a different sound than the letter *c* in the target) and when the transposed-letter prime did not involve a change in phonology (e.g., *cholocate-CHOCOLATE*, the sound of the letter *c* is the same in the prime and the target). Furthermore, using a syllabic script (Katakana), in which orthography and phonology can be elegantly disentangled, Perea and Pérez (2009) failed to find any signs of a masked priming effect when transposing two vowels/consonants in two internal morae. That is, the nonword prime *a.re.mi.ka* [アレミカ] did not facilitate the processing of the target word *a.me.ri.ka* [アメリカ] relative to the control nonword prime *a.ke.hi.ka* [アケヒカ].

However, there is also evidence supporting the role of phonology in early processes involved in visual-word recognition (see Frost, 1998). More specifically, a recent study of Frankish and Turner (2007) has been taken as evidence of phonological involvement in letter position coding. Frankish and Turner (2007) found that (briefly presented) nonwords formed by transposing two letters were more likely to be misclassified as words if the nonwords were unpronounceable (*sotrm*; i.e., via an illegal bigram) than if they were

DOI: 10.1027/1618-3169/a000029

pronounceable (*strom*; via a legal bigram). Frankish and Turner suggested that phonological (top down) feedback modulates the transposed-letter effect. Consistent with this finding, Perea and Carreiras (2008) found that masked transposed-letter priming effects were greater when the transposed-letter primes formed an illegal letter string (e.g., *comsos-COSMOS*; "ms" is an illegal bigram in Spanish) than when the transposed-letter primes formed a legal letter string. However, all these "bigram frequency" effects could just be due to orthotactics rather than phonology. As Grainger (2008) indicated, given that "orthotactics was again (and inevitably so) confounded with pronounceability in this study, it would appear premature to draw any firm conclusions for the time being" (p. 14).

One possibility is that phonology might co-occur with the early stages of letter position coding and that, for some reason, this phenomenon has not been properly captured in the previous transposed-letter experiment. For instance, one could argue that the reason why Perea and Carreiras (2006, 2008) or Perea and Pérez (2009) failed to find a letter/mora transposition effect is that the phonological manipulation always involved *internal* syllables. Keep in mind that, in syllable-timed languages, masked phonological priming effects are robust in the initial syllable, whereas they tend to vanish in the subsequent syllables (see Carreiras & Perea, 2002; Carreiras et al., 2005; Kouider, Dehaene, Jobert, & Le Bihan, 2007, for recent evidence). One excellent example is the experiment of Carreiras et al. (2005). They found faster responses to *fomie-FAUCON* than to *fémie-FAUCON* (i.e., a masked phonological priming effect in the initial syllable), but not faster responses to *retôt-GATEAU* than to *retin-GATEAU* (i.e., an absence of a phonological priming effect in the second syllable). Carreiras and colleagues concluded that "phonological processing for polysyllabic words is sequential" (p. 588).

One direct way to examine this question would be to transpose the initial letters of a word (e.g., *sacino-CASINO* vs. *vamino-CASINO*). However, transposing the initial letters produces a vanishing transposed-letter priming effect (see Johnson et al., 2007 for evidence in normal reading and parafoveal previews, and see Perea & Lupker, 2007 for evidence in masked priming lexical decision). But there is another alternative: using the logic of the Carreiras et al. (2005) experiment, we can use the initial *phonological* syllable and transpose two internal (consonant) letters, as in *kaniso-CASINO*. This is the manipulation employed in this experiment. If early letter position encoding processes (as captured by a masked priming paradigm) were purely orthographic, then the transposed-letter prime *caniso* should facilitate the response to *CASINO* in comparison with the orthographic control prime *caviro*, and there should be small/null differences between the responses to *CANISO* when it is preceded by the "pseudohomophone" transposed-letter prime *kaniso* or its appropriate control *kaviro*. In contrast, if there is a very fast activation from phonology for the initial syllable (as suggested by Carreiras et al., 2005; see also Álvarez, Carreiras, & Perea, 2004), both *caniso-CASINO* and *kaniso-CASINO* should produce a similar transposed-letter priming effect compared with their appropriate control conditions. What we should note here is that in the pseudohomophone transposed-letter priming condition (*kaniso-CASINO*), the initial letter always has an unambiguous pronunciation (*k* is always pronounced as /k/), whereas in the transposed-letter priming, the initial letter (*c*) in Spanish (and other Western languages) has an ambiguous pronunciation which depends on the following letter – that is, we have tried to maximize our chances to obtain a phonological effect.

In sum, we conducted a masked priming experiment to test the role of phonology in letter position coding via a transposed-letter manipulation. Specifically, we examined whether a pseudohomophone transposed-letter prime produces faster identification times on a target word relative to the appropriate control condition (e.g., *kaniso-CASINO* vs. *kaviro-CASINO*). For comparison purposes with prior research, we included a transposed-letter condition *caniso-CASINO* (vs. *caviro-CASINO*) – note that the pseudohomophone transposed-letter prime always differed in the initial letter. As in prior experiments (Perea & Carreiras, 2006, 2008; Pollatsek, Perea, & Carreiras, 2005), we employed the lexical decision task, because the naming task may have an inherent phonological component (see Ferrand, Seguí, & Humpreys, 1997). Bear in mind that our main aim was to capture the presence of phonological processes in (silent) word processing.

Method

Participants

Twenty-four students from the Universidad del País Vasco took part voluntarily in the experiment. All participants reported being native speakers of Spanish with normal or corrected-to-normal vision. All participants also had some knowledge of Basque – a pre-Indo-European language with no ties to Romance languages.

Materials

A set of 72 Spanish three-syllable words of six and seven letters long (mean number of letters: 6.2) was selected for the experiment (see Appendix). The mean word frequency was 26 per million, range 0.18–352 in the Spanish database (Davis & Perea, 2005), and the mean number of the orthographic neighbors was 2.4. All the words included a context-sensitive letter (either "c" or "g") in the first position. In Castilian Spanish, the letter "c" sounds */k/* when followed by the letter "a", "o", or "u", but */θ/* when followed by the letter "e" or "i". Similarly, the letter "g" sounds */g/* when followed by the letter "a", "o", or "u", but */j/* when followed by the letter "e" or "i". The targets were presented in uppercase and were preceded by a lowercase nonword prime that (i) shared all the letters with the target, and also all the phonemes save for the first one, with a nonadjacent transposition of two consonants (*caniso-CASINO,* transposed-letter condition), (ii) was the same as the transposed-letter prime except that the initial letter was replaced by another with the same sound (*kaniso-CASINO*, pseudohomophone transposed-letter condition), (iii) was the same as the transposed-letter prime except that the transposed letters were replaced by another with a different sound (*caviro-CASINO*, orthographic control for the transposed-letter condition; note that the shape of the initial letter – in terms of ascending/descending letters – was matched with the pseudohomophone transposed-letter prime), and (iv) was a nonword prime unrelated to the target stimulus (*kaniso-CASINO*, orthographic control for the pseudohomophone transposed-letter condition). None of the nonword primes had any one-letter different word neighbors (i.e., Coltheart's *N* was 0). An additional set of 72 nonwords with the same syllabic structure of the target words were included for the purposes of the lexical-decision task. The nonwords were created by changing two/three letters from Spanish words, and the manipulation of the nonword trials was the same as that for the word trials. Four lists of materials were constructed so that each target appeared once in each list, but each time in a different priming condition. Different groups of participants were assigned to each list.

Procedure

Participants were tested individually in a quiet room. The experiment was run using DMDX (Forster & Forster, 2003). Reaction times were measured from target onset until the participant's response. On each trial, a forward mask consisting of a row of hash marks (#'s) matched in length with the target was presented for 500 ms in the center of the screen. Next, a centered lowercase prime was presented for 50 ms. Primes were immediately replaced by an uppercase target item, which remained on the screen until the response. Participants were instructed to press one of two buttons on the keyboard to indicate whether the uppercase letter string was a legitimate Spanish word or not ("m" for yes and "z" for no). Participants were instructed to make this decision as quickly and as accurately as possible. They were not informed of the presence of prime stimuli, and none of them reported (after the experiment) conscious knowledge of the existence of any prime. Each participant received a different order of trials. Each participant received a total of 20 practice trials (with the same manipulation as in the experimental trials) prior to the experimental trials. Each session lasted ~ 15 min.

Results

Incorrect responses (6.9% and 4.9% of the data for word and nonword targets, respectively) and reaction times < 250 or > 1500 ms (1.6% and 3.1% of the data for word and nonword targets, respectively) were excluded from the latency analyses. The mean latencies and percentage of errors for the word targets are presented in Table 1. Participant and item ANOVAs for the lexical decision times and percentage of errors were conducted based on a 2 (Type of prime: Transposed-letter and control) × 2 (Prime/target relationship: Orthography + Phonology and Phonology) × 4 (List: list 1, list 2, list 3, and list 4). List was included as a dummy variable to extract the error variance due to counterbalancing (Pollatsek & Well, 1995). All significant effects had *p* values less than the .05 level.

Table 1. Mean lexical decision times (in ms) and percentage of errors (in parentheses) for word and nonword targets in the experiment

	Type of prime		
	Transposed letter	Control	Priming
Word trials			
Orthography + phonology	663 (7.1)	686 (6.7)	23 (−0.4)
Phonology only	678 (7.2)	677 (6.6)	−1 (−0.6)
Nonword trials			
Orthography + phonology	770 (5.1)	766 (4.9)	−4 (−0.2)
Phonology only	779 (5.0)	776 (4.9)	−3 (−0.1)

Word Data

The latency analysis revealed an interaction between Type of prime and Type of prime-target relationship, $F1(1, 20) = 4.48$, $MSE = 746.5$; $F2(1, 68) = 4.60$, $MSE = 4{,}331.6$: This interaction reflected a 23-ms transposed-letter priming effect for *caniso-CASINO* relative to its appropriate orthographic control (*caviro-CASINO*), $F1(1, 20) = 10.61$, $MSE = 529.1$; $F2(1, 68) = 5.51$, $MSE = 4{,}312.6$, whereas there were no signs of a priming effect for the pseudohomophone transposed-letter *kaniso* (relative to its control *kaviro*).

None of the effects in the error analysis were significant (all ps > .11).

Nonword Data

We failed to find any signs of an effect in the latency/error data (all ps > .20).

Discussion

The main findings of this experiment were (i) the presence of an orthographic masked priming effect by using transposed-letter stimuli (*caniso-CASINO* faster than *caviro-CASINO*) and (ii) the absence of a phonological transposed-letter priming effect (i.e., similar response times for *kaniso-CASINO* and *kaviro-CASINO*). Taken together, these findings have important implications for the choice of an input coding scheme of the letter encoding process.

This experiment sheds additional light on the role of orthography and phonology in the transposed-letter priming effect. As indicated in the Introduction, the evidence of a role of phonology in the early stages of letter position coding is very limited. Of course, it is difficult to accept the null hypothesis, and one could argue that the manipulation in the Perea and Carreiras (2006, 2008) and in the Perea and Pérez (2009) experiments occurred in internal syllables. Keep in mind that there is evidence that shows that masked phonological priming tends to vanish in internal syllables (Carreiras et al., 2005). The present experiment fills this gap, since we manipulated the orthography of the initial letter/syllable by keeping exactly the same sound (i.e., the transposed-letter prime *caniso* sounds exactly the same as the pseudohomophone transposed-letter prime *kaniso*). As in prior research, we found the typical transposed-letter effect (*caniso-CASINO* being responded faster than *caviro-CASINO*; Perea & Lupker, 2004), and we failed to get any signs of an effect of phonology: The response times for *kaniso-CASINO* and its control *kaviro-CASINO* were virtually the same. Consistent with this pattern of data, Grainger, Kiyonaga, and Holcomb (2006) found that masked transposed-letter priming (*barin-BRAIN* vs. *bosin-BRAIN*) and masked pseudohomophone priming (*brane-BRAIN* vs. *brant-BRAIN*) have different topographical and temporal distributions using event related potentials. Thus, the data from Grainger and colleagues revealed that putatively orthographic effects such as the transposed-letter effect arose earlier than phonological effects. What is more, using parafoveal previews in a normal reading task – which is highly sensitive to phonological influences, Acha, Perea, and Nakataki (2009, April) found that the fixation durations on a target word in Katakana (a.me.ri.ka [アメリカ]) was similar when the preview was the "transposed-phoneme" nonword a.re.mi.ka [アレミカ] and when the preview was the nonword control a.ke.hi.ka [アケヒカ]. In addition, there does not seem to be a confusability effect when transposed-letter nonwords (e.g., *cholocate*) are presented *auditorily* (Bowers, 2008; i.e., the response times and error rates are similar to those of replacement-letter nonwords), which again adds support to the view that transposed-letter effects originate from prelexical orthographic processing rather than from phonological processing. Finally, we should note here that we have also employed additional manipulations to those presented in this paper (e.g., using a longer SOA in this experiment, or comparing *cuniso-CASINO* vs. *ceniso-CASINO*, among others), but once more we failed to find a modulating effect of phonology on the magnitude of the transposed-letter priming effect.[1] Taken together, the more parsimonious account is that letter position coding is chiefly orthographic in nature.

How can the recently proposed input coding schemes for visual-word recognition accommodate the present data? As indicated in the Introduction, the SERIOL model assumes the presence of a phonological route that operates with biphones in the same way that the orthographic route operates with bigrams (Whitney & Cornelissen, 2005, 2008). Both bigrams and biphones formed by the initial letters would entail more activation than the final ones. Specific simulations on an implemented version of the model are necessary, although it seems that the SERIOL model would (wrongly) predict an advantage of *kaniso-CASINO* over *kaviro-CASINO* – in terms of shared biphones. Nonetheless, the model is not completely explicit on whether the activated biphones compete with the activated bigrams at some level. (In fairness to the SERIOL model, we should indicate that the presence of biphones captures other phenomena, such as the *conal-CANAL* vs. *cinal-CANAL* effect (Pollatsek et al., 2005). With respect to the other input coding schemes (e.g., SOLAR model, Davis, 1999; open-bigram model, Grainger & van Heuven, 2003; overlap model, Gómez et al., 2008), even though the "front end" of these models does not need to be modified, the dynamics should be adapted to deal with phonological processing, such as the *conal-CANAL* vs. *cinal-CANAL* effect (see Pollatsek et al., 2005), or the *fomie-FAUCON* effect (Carreiras et al., 2005), among others.

In sum, using a simple (but elegant) design, this experiment demonstrates that the transposed-letter priming effect occurs at an early orthographic level without being influenced by phonology. Even though phonological coding takes place at a very early stage of word processing – as deduced from a number of masked phonological priming experiments, this stage seems to occur slightly later than letter position coding – which is essentially orthographic. The reported finding is consistent with recently proposed coding schemes such as the SOLAR, open-bigram, and overlap models.

Acknowledgments

The research reported in this article has been supported by Grant PSI2008-04069/PSIC from the Spanish Ministry of Science and Innovation, Spain, and by Grant BFI05.33 from the Department of Education, Universities, and Research of the Basque Government. We thank two anonymous reviewers for very helpful suggestions on an earlier version of the paper.

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[1] In addition, in another experiment, we found significantly faster (12 ms) response times to *kaniso-CASINO* than to *daniso-CASINO*. Although this could be taken as evidence of a phonological influence on letter position coding, there was a confounding here. The stimuli *kaniso* and *CASINO* share the initial phonological syllable, and thereby this difference may just reflect a syllable priming effect (e.g., as reported by Carreiras et al., 2005).

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Appendix

Pairs in the experiment

The items are arranged in quintuplets in the following order: Transposed-letter prime, phonological transposed-letter prime, orthographic control prime, phonological control prime, and, in uppercase, the target word.

cañaba	kañaba	carata	karata	CABAÑA
cavader	kavader	casaler	kasaler	CADÁVER
canojes	kanojes	caropes	karopes	CAJONES
camalar	kamalar	cavadar	kavadar	CALAMAR
cañala	kañala	caraba	karaba	CALAÑA
caroles	karoles	camodes	kamodes	CALORES
cadama	kadama	catara	katara	CAMADA
carama	karama	canasa	kanasa	CÁMARA
caranio	karanio	casavio	kasavio	CANARIO
catuno	katuno	cabuso	kabuso	CANUTO
canoñes	kanoñes	caroves	karoves	CAÑONES
cacarol	kacarol	camaxol	kamaxol	CARACOL
calatan	kalatan	cafadan	kafadan	CATALÁN
cezina	zezina	cemisa	zemisa	CENIZA
cediño	zediño	cetiso	zetiso	CEÑIDO

continued on next page

Appendix continued.

cezera	zezera	cemena	zemena	CEREZA
cicivo	zicivo	ciniwo	ziniwo	CÍVICO
coyaba	koyaba	cojafa	kojafa	COBAYA
cotoge	kotoge	colope	kolope	COGOTE
conolia	konolia	cosofia	kosofia	COLONIA
conolo	konolo	corodo	korodo	COLONO
coroles	koroles	comofes	komofes	COLORES
cosolo	kosolo	covoto	kovoto	COLOSO
codomo	kodomo	cofoso	kofoso	CÓMODO
cojare	kojare	copame	kopame	CORAJE
cozara	kozara	cosaña	kosaña	CORAZA
cozaron	kozaron	comavon	komavon	CORAZÓN
conora	konora	cosoma	kosoma	CORONA
cotoye	kotoye	cofoje	kofoje	COYOTE
cudaño	kudaño	cutaro	kutaro	CUÑADO
culupa	kulupa	cubuya	kubuya	CÚPULA
gelemo	jelemo	gebeco	jebeko	GEMELO
gerenal	jerenal	gesemal	jesemal	GENERAL
gereno	jereno	geveso	jeveso	GÉNERO
cazeba	kazeba	camefa	kamefa	CABEZA
caniba	kaniba	casifa	kasifa	CABINA
caneda	kaneda	cameba	kameba	CADENA
careda	kareda	cañefa	kañefa	CADERA
catede	katede	calefe	kalefe	CADETE
cadilad	kadilad	cafitad	kafitad	CALIDAD
cazila	kazila	caniba	kaniba	CALIZA
calemia	kalemia	cafevia	kafevia	CAMELIA
canimo	kanimo	casivo	kasivo	CAMINO
casima	kasima	caviña	kaviña	CAMISA
calena	kalena	cabeva	kabeva	CANELA
cabinal	kabinal	cafisal	kafisal	CANÍBAL
cacina	kazina	casira	kasira	CANICA
cajino	kajino	capiso	kapiso	CANIJO
catipal	katipal	cafijal	kafijal	CAPITAL
cañiro	kañiro	camiso	kamiso	CARIÑO
cojibo	kojibo	copilo	kopilo	COBIJO
cotehe	kotehe	codefe	kodefe	COHETE
conila	konila	cosifa	kosifa	COLINA
codemia	kodemia	cofesia	kofesia	COMEDIA
cotema	kotema	colesa	kolesa	COMETA
cocimo	kozimo	cosivo	kosivo	CÓMICO
codima	kodima	cotira	kotira	COMIDA
cotime	kotime	cofire	kofire	COMITÉ
cojeno	kojeno	copeso	kopeso	CONEJO
cozitar	kozitar	covihar	kovihar	COTIZAR
cudipo	kudipo	cutigo	kutigo	CUPIDO
catera	katera	cobesa	kobesa	CARETA
casono	kasono	cavomo	kavomo	CANOSO
cedalor	zedalor	cetafor	zetafor	CELADOR
genario	jenario	gevasio	jevasio	GERANIO
gisarol	jisarol	gimanol	jimanol	GIRASOL
ginato	jinato	girabo	jirabo	GITANO
cadala	kadala	cafata	kafata	CALADA
cutala	kutala	cubada	kubada	CULATA
cilaga	zilaga	cifaja	zifaja	CIGALA
caniso	kaniso	caviro	kaviro	CASINO
gedilo	jedilo	getifo	jetifo	GÉLIDO
coñesa	koñesa	covera	kovera	COSEÑA

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Appendix continued.

cuviser	kuviser	cumiñer	kumiñer	CUSIVER
conuses	konuses	corumes	korumes	COSUNES
cositar	kositar	covilar	kovilar	COTISAR
cuñeta	kuñeta	cusela	kusela	CUTEÑA
corutes	korutes	comules	komules	COTURES
codita	kodita	cofida	kofida	COTIDA
curola	kurola	cusoha	kusoha	CULORA
coretio	koretio	covelio	kovelio	COTERIO
cutamo	kutamo	culaso	kulaso	CUMATO
conupes	konupes	corujes	korujes	COPUNES
cucisol	kucisol	cumirol	kumirol	CUSICOL
culipán	kulipán	cudiyán	kudiyán	CUPILÁN
cisepa	zisepa	cimeja	zimeja	CIPESA
cidago	zidago	citayo	zitayo	CIGADO
cizuma	zizuma	cirusa	zirusa	CIMUZA
cecaro	zecaro	cemavo	zemavo	CERACO
cuyesa	kuyesa	cujema	kujema	CUSEYA
catile	katile	cadife	kadife	CALITE
canutia	kanutia	carulia	karulia	CATUNIA
cunevo	kunevo	cusemo	kusemo	CUVENO
curives	kurives	cusimes	kusimes	CUVIRES
casito	kasito	cavibo	kavibo	CATISO
cudelo	kudelo	cutefo	kutefo	CULEDO
cajise	kajise	capime	kapime	CASIJE
cuzeta	kuzeta	cumefa	kumefa	CUTEZA
cuzavón	kuzavón	cusamón	kusamón	CUVAZÓN
canuma	kanuma	cavura	kavura	CAMUNA
cutafe	kutafe	cudabe	kudabe	CUFATE
cadofo	kadofo	caloho	kaloho	CAFODO
calita	kalita	cafida	kafida	CATILA
giloso	jiloso	gidoro	jidoro	GISOLO
giropal	jiropal	gisoyal	jisoyal	GIPORAL
giraco	jiraco	gimaso	jimaso	GICARO
cozala	kozala	cosata	kosata	COLAZA
cunega	kunega	curepa	kurepa	CUGENA
conapa	konapa	cosaja	kosaja	COPANA
coripa	koripa	comija	komija	COPIRA
cutiñe	kutiñe	cufise	kufise	CUÑITE
cudopad	kudopad	culojad	kulojad	CUPODAD
cuzera	kuzera	cumesa	kumesa	CUREZA
colania	kolania	codaria	kodaria	CONALIA
cunalo	kunalo	cuvafo	kuvafo	CULANO
cosuva	kosuva	cowuma	kowuma	COVUSA
culida	kulida	cutifa	kutifa	CUDILA
cobulal	kobulal	cotufal	kotufal	COLUBAL
cucema	kucema	cuseña	kuseña	CUMECA
cojalo	kojalo	coyabo	koyabo	COLAJO
cutoval	kutoval	cubomal	kubomal	CUVOTAL
coñumo	koñumo	coruso	koruso	COMUÑO
cajeto	kajeto	capedo	kapedo	CATEJO
cutaje	kutaje	cudape	kudape	CUJATE
cunova	kunova	cusoma	kusoma	CUVONA
cadijia	kadijia	catipia	katipia	CAJIDIA
catova	katova	cafosa	kafosa	CAVOTA
cacedo	kacedo	cameto	kameto	CADECO
cudefa	kudefa	cutela	kutela	CUFEDA
catode	katode	cafole	kafole	CADOTE
cujapo	kujapo	cuyago	kuyago	CUPAJO

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Appendix continued.

cuzemar	kuzemar	cuñevar	kuñevar	CUMEZAR
codelo	kodelo	cotefo	kotefo	COLEDO
cutapa	kutapa	codaja	kodaja	CUPATA
cosifo	kosifo	covibar	kovibar	COFISO
cidumor	zidumor	cituvor	zituvor	CIMUDOR
ginutio	jinutio	girufio	jirufio	GITUNIO
gesotol	jesotol	gerodol	jerodol	GETOSOL
genuso	jenuso	gevumo	jevumo	GESUNO
codeta	kodeta	cofela	kofela	COTEDA
cotura	kotura	codusa	kodusa	CORUTA
celova	zelova	cefoma	zefoma	CEVOLA
conamo	konamo	coraso	koraso	COMANO
gideto	jideto	gifelo	jifelo	GITEDO

Received March 16, 2008
Revision received May 3, 2009
Accepted May 5, 2009
Published online: December 14, 2009

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