

Universal Multiple-Octet Coded Character Set
International Organization for Standardization
Organisation Internationale de Normalisation
Международная организация по стандартизации

Doc Type: Working Group Document**Title: On GREEK LETTER KOPPA****Source: Michael Everson, EGT (IE)****Status: Discussion and proposal****Action: For consideration by JTC1/SC2/WG2 and UTC****Date: 1998-12-12**

Constantine Stathopoulos has asserted that a distinction needs to be made between GREEK LETTER KOPPA and GREEK NUMERAL KOPPA. This distinction is based in his assertion that a Q-shaped KOPPA is used in text, but a Z-shaped KOPPA is used as a numeral in modern Greek practice – and that modern Greek users do not recognize the identity of the two signs. In this document I will examine the evidence to hand. (Stathopoulos prefers the term “sigmoid KOPPA” to “Z-shaped KOPPA”, but I consider the latter to be more convenient in English.)

Cook 1987 presents a convenient table with 5 archaic Greek alphabets.

			Ionia	Athens	Corinth	Argos	Euboea (cf. Etruscan)
A	α	a	AA	AA	AA	AA	AA
B	β	b	B	B	Π	▷	B
Γ	γ	g	Γ	Λ	◁◁	▷Λ	◁◁
Δ	δ	d	Δ	Δ	Δ	▷	▷▷
E	ε	e	⊖E	⊖E	⊖	⊖E	⊖E
F	F	w	—	⊖	⊖	⊖⊖	⊖
Z	ζ	z	I	I	I	I	I
H	η	ē	⊖H	—	—	—	—
	[h]	h	—	⊖H	⊖H	⊖H	⊖H
Θ	θ	th	⊖⊖⊖	⊖⊖⊖	⊖⊖⊖	⊖⊖⊖	⊖⊖⊖
I	ι	i	I	I	ε	I	I
K	κ	k	K	K	K	K	K
Λ	λ	l	▷Λ	▷	▷Λ	▷	▷
M	μ	m	⊖⊖	⊖⊖	⊖⊖	⊖⊖	⊖⊖⊖
N	ν	n	⊖N	⊖N	⊖N	⊖N	⊖N
Ξ	ξ	x	Ξ	(XS)	Ξ	ΞH	X
O	ο	o	O	O	O	O	O
Π	π	p	▷	▷	▷	▷	▷▷
Ϻ	—	s	—	—	M	M	M(?)
Ϻ	ρ	q	Ϻ	Ϻ	Ϻ	Ϻ	Ϻ
Ρ	ρ	r	▷▷	▷▷	▷▷	▷▷	▷
Σ	σς	s	ε	ς	—	ε	ς
T	τ	t	T	T	T	T	T
Υ	υ	u	ΥΥ	ΥΥ	ΥΥ	ΥΥ	ΥΥ
Φ	φ	ph	Φ	Φ⊖	Φ⊖	Φ⊖	Φ⊖
Χ	χ	kh	X	X	X	X	ΥΨ
Ψ	ψ	ps	ΥΨ	(Φς)	ΥΨ	Ψ	(Φς)
Ω	ω	ō	ΩΩ	—	—	—	—

Table 1. Some archaic alphabets

Note the letters DIGAMMA, SAN (> SAMPI), and Q-shaped KOPPA. Note also the capital and small versions of these letters (but not SAN) in the modern Greek typeface on the left.

Cook 1987 also gives a convenient summary of the letters used numerically:

$\alpha = 1$	$\iota = 10$	$\rho = 100$
$\beta = 2$	$\kappa = 20$	$\sigma = 200$
$\gamma = 3$	$\lambda = 30$	$\tau = 300$
$\delta = 4$	$\mu = 40$	$\upsilon = 400$
$\epsilon = 5$	$\nu = 50$	$\phi = 500$
$F = 6$	$\xi = 60$	$\chi = 600$
$\zeta = 7$	$\omicron = 70$	$\psi = 700$
$\eta = 8$	$\pi = 80$	$\omega = 800$
$\theta = 9$	$\rho = 90$	$\aleph = 900$

Table 2. Alphabetic numerals

Note the use of DIGAMMA as 6, Q-shaped KOPPA as 90, and SAMPI as 900.

Threatte 1996 gives a similar summary of the letters used numerically:

TABLE 22.5: *Alphabetic Numerals*

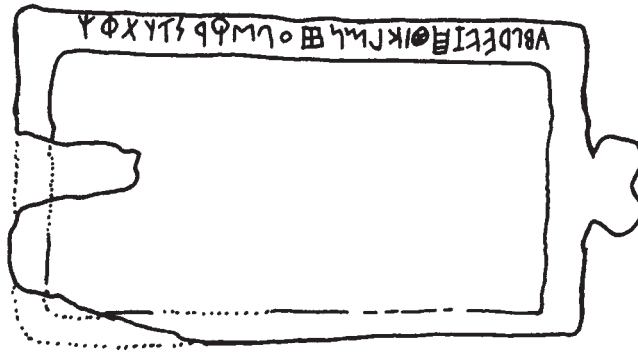
α	1	ι	10	ρ	100
β	2	κ	20	σ	200
γ	3	λ	30	τ	300
δ	4	μ	40	υ	400
ϵ	5	ν	50	ϕ	500
F or ζ or $\sigma\tau$	6	ξ	60	χ	600
ζ	7	\omicron	70	ψ	700
η	8	π	80	ω	800
θ	9	φ	90	\aleph	900

Note the use of DIGAMMA, STIGMA, and SIGMA-TAU as 6, Q-shaped KOPPA as 90, and SAMPI as 900. When DIGAMMA was lost, STIGMA seems to have been substituted for it. When STIGMA is not available, SIGMA-TAU was often substituted – but note that in Κουμαριανος *et al.* 1986 FINAL SIGMA is regularly substituted for STIGMA for 6:

211. α' Άνθη Εύλαβείας. Βενετία, Bortoli, 1708.
 β' Βιβλος... καλοκαιρινή... Άγαπίου. Σάρος, 1692.
 γ' Βιβλίον όνομαζόμενον... Θησαυρός. Σάρος, 1685.
 δ' Άνθη Εύλαβείας. Bortoli, 1708.
 ϵ' Δαμασκηνός Στουδίτης, Θησαυρός. Σάρος, 1742.
 ζ' Άνθη Εύλαβείας. Bortoli, 1708.
 ξ' Βιβλίον όνομαζόμενον... Θησαυρός. Σάρος, 1685.
 η' Πεντηκοστάριον... Σάρος, 1739.
 θ' Βιβλίον όνομαζόμενον... Θησαυρός. Σάρος, 1685.
 ι' Βησ. Μακρής, Σταχυολογία... Σάρος, 1694.

Powell 1996 gives an interesting example of an early Greek abecedary, and gives a transcription of the *capital* letters of the original into *small* letters. All of these letters are small letters (including DIGAMMA, the unusual ETA, SAN and Q-shaped KOPPA), though in this particular font (which looks like Victor Scholderer's "Neo-Hellenic") the SAN looks like a capital MU and the KOPPA's stem does not descend below the baseline. As capitals in the original inscription all the letters would seem to be intended to align.

No. 55 (after Heubeck, 1979: fig. 56)



←
α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π μ ϑ ρ σ τ υ χ ϕ ψ

A certain inelegance in design of archaic letters like these is common (with all respect to Scholderer) because of their relative unfamiliarity and lack of traditional development. I have received similar comments on the design of archaic Georgian characters from experts in Georgian. In the Annex, Yannis Haralambous gives a number of interesting modern designs for these letters. Speaking as a typographer, I like them all well enough, except for the reversed capital RHO used for capital KOPPA, which seems to me to be a wildly inauthentic interpretation, given, for instance, Powell's sample shown above.

Liddell 1972 (1889) shows a tall capital Q-shaped KOPPA with tail below the baseline in their definition of the word. Note also how the reader is referred to STAU (< WAU = DIGAMMA) and SAMPI.

κόππα, τό, a letter of the ancient Greek alphabet (Ϟ)
retained as a numeral = 90, between π (80), and ρ (100);
and this shews that it was the same as the Hebr. ק
(*Koph*) and Lat. Q; cf. σταῦ, σάμπι.
κοππᾶτίας, δ, branded with the letter *Koppa* (Ϟ) as a
mark, ἵππος κ. Ar.; cf. σαμόρας.

Smyth 1984 (1920) shows capital and small DIGAMMA, a Q-shaped KOPPA of indeterminate (probably upper) case, and a SAMPI of indeterminate case.

3. In the older period there were two other letters: (1) F: φαῦ, *vau*, called *digamma* (*i.e. double-gamma*) from its shape. It stood after ε and was pronounced like *w*. F was written in Boeotian as late as 200 B.C. (2) Ϝ: κόππα, *koppa*, which stood after π. Another s, called *san*, is found in the sign ϝ, called *sampi*, *i.e. san + pi*. On these signs as numerals, see 348.

Δημητράκος 1964 gives definitions of SAN and KOPPA, showing (apparently) capital versions of the letters.

Μ

Ϟ

Μ τὸ δέκατον ὄγδοον γράμμα τοῦ τυρρητικοῦ ἀλφαβήτου (Ἐπιγρ.) καὶ πιθανῶς καὶ τῶν ἀρχαιοτάτων ἑλληνικῶν ἀλφαβήτων, προφερόμενον **σάν**, δυνάμενον δὲ νὰ ταυτισθῇ πρὸς τὸ ἑβραϊκὸν **טאָד**, ὅπερ κατέχει τὴν αὐτὴν ἐν τῇ σειρᾷ τῶν γραμμάτων θέσιν. Εἰς πολλὰ ἐκ τῶν παλαιότερων ἑλληνικῶν ἀλφαβήτων εἶναι ἰσοδύναμον πρὸς τὸ γράμμα Σ, θεωρούμενον μάλιστα ὡς δωρικὴ ὀνομασία τοῦ γράμματος τούτου πρὸλ. Ἡρ. I, 139 «τὸ Δωριέες μὲν σάν καλέουσι, Ἴωνες δὲ σίγμα».

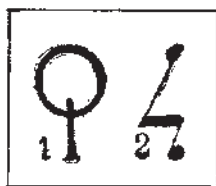
Ϟ **κόππα**, γράμμα τῶν ἀρχαιοτάτων ἑλληνικῶν ἀλφαβήτων (Ἐπιγρ.), ἀπαντῶν καὶ εἰς κορινθιακὰ καὶ ἄλλα νομίσματα, κείμενον μεταξὺ τῶν η κ ρ. Δέκατον ἕνατον τοῦ τυρρητικοῦ ἀλφαβήτου (Ἐπιγρ.), ἦτο ἀντίστοιχον πρὸς τὸ ἑβραϊκὸν **קופ**. Εἶχε τὴν προφορὰν τοῦ λαρυγγικοῦ κ (q), ἐν χρήσει καταστάντος καὶ διὰ τὴν προφορὰν ταύτην τοῦ κ. Ὡς ἀριθμητικὸν ἰσοδύναμι πρὸς τὸ 90. Ἐν χρ. κ. εἰς τὴν παροιμ. οὐδὲ **κόππα** γινώσκων (ἐπὶ ἀμαθοῦς ἢ ἀνοήτου) : Παρμέν. I.

Capital and small Q-shaped KOPPA with capital and small Z-shaped KOPPA, from the font “TmsU14ttPF-Rom” by Production First Software (provided by John Fiscella). The characters are aligned to the drawn baseline. The evidence suggests that the Z-shaped KOPPA can also descend below the baseline.



The Ilios Encyclopædic Lexicon shows both glyphs; the Z-shaped KOPPA has a different shape than one usually sees (it looks to be rotated 180°). The text describes how KOPPA was used before OMEGA and UPSILON, and how KAPPA was used before ALPHA and EPSILON. It does not mention the difference in the glyphs specifically.

κόππα. Γράμμα τοῦ ἀρχαιοτάτου ἑλληνικοῦ ἀλφαβήτου. Ἐχει τὸ σχῆμα κύκλου ἐπὶ καθέτου γραμμῆς (βλέπε σχῆμα), ἔρχεται κατὰ σειράν μεταξὺ τῶν γραμμάτων Π καὶ Ρ, ἰσοδυναμεῖ ἠχητικῶς πρὸς τὸ Κ καὶ ἀντιστοιχεῖ πρὸς τὸ συριακο - ἑβραϊκὸν γράμμα **קופ** καὶ πρὸς τὸ λατινικὸν q. Τὸ **κόππα** ἐχρησιμοποιεῖτο μετὰ τοῦ ὁμοφώνου τοῦ κάππα. Καὶ τὸ μὲν κάππα ἐτίθετο πρὸ τῶν σκληρῶν φωνηέντων α καὶ ε, τὸ δὲ **κόππα** πρὸ τῶν μαλακωτέρων ο καὶ υ. Τὸ **κόππα** διετηρήθη ὡς γράμμα μέχρι τῆς μεταρρυθμίσεως τοῦ πρωταρχικοῦ ἀλφαβήτου καὶ τῆς ἀντικαταστάσεως αὐτοῦ ὑπὸ τοῦ σαμιακοαθηναϊκοῦ τὸ 525 π.Χ.,



Κόππα. εἶκοτε δὲ παρέμεινεν ὡς σῆμα ἐπὶ τῶν νομισμάτων τῆς Κορίνθου καὶ τῶν ἀποικιῶν τῆς Συρακουσῶν καὶ Κρότωνος, ὡς καὶ ὡς ἀριθμητικὸν σημεῖον διὰ τὸν ἀριθμὸν 90. Ἡ χρῆσις τοῦ **κόππα** ἦτο κοινὴ κατὰ τοὺς ἀρχαιοτάτους χρόνους, ἐξ οὗ καὶ ἡ παροιμία «οὐδὲ **κόππα** γινώσκων», ἢ λεγομένη ἐπὶ ἀγραμμάτων.

B.Δ.Θ.

Haarmann 1990 presents a table with the Phoenician prototype, 3 archaic Greek alphabets, and an early classical Greek alphabet. The archaic Greek alphabets show DIGAMMA, SAN, and Q-shaped KOPPA, while the classical Greek alphabet shows (what appears to be) STIGMA, SAMPI, and a prototypical Z-shaped KOPPA (see “The Missing Link” below).

(167) Varianten des griechischen Alphabets und ihre Beziehung zur phönizischen Schrift

ALT-PHÖNIKISCH			ARCHAISCH 7.Jh.		ÖSTLICH 8.Jh.		WESTLICH 6.Jh.		WESTLICH 5.Jh.			KLASSISCH			Moderner Druck	Name der Buchstaben		
Zeichen	Lautwert	Zahlwert	Thera	Lautwert	Athen vor 403	Miles. Alphabet	Lautwert	Lakon. Alphabet	Lautwert	Zeichen	Lautwert	Zahlwert	Zeichen	Lautwert	Zahlwert	in lateinischer Schrift	in griechischer Schrift	
𐤀	ʾ	1	Α Α	a	𐀀 𐀁	Α Α	a	𐀀 𐀁	a	Α	a	1	Α	a	1	A	alpha	ἄλφα
𐤁	b	2	Β Β	b	𐀂 𐀃	Β Β	b	Β	b	Β	b	2	Β	b	2	B	bēta	βῆτα
𐤂	g	3	Γ Γ	g	𐀄 𐀅	Γ Γ	g	Γ	g	Γ	g	3	Γ	g	3	Γ	gamma	γάμμα
𐤃	d	4	Δ Δ	d	𐀆 𐀇	Δ Δ	d	Δ Δ	d	Δ	d	4	Δ	d	4	Δ	delta	δέλτα
𐤄	h	5	Ε Ε	e	𐀈 𐀉	Ε Ε	e	Ε Ε	e	Ε	e	5	Ε	e	5	E	epsilon	ἔψιλον
𐤅	w	6					v	𐀊	v	Ϛ		6			6		(digamma)*	←
𐤆	z	7	Ζ Ζ	z	𐀋 𐀌	Ζ Ζ	z		z	Ζ	z	7	Ζ	z	7	Z	zēta	ζῆτα
𐤇	h	8	Η Η	h, ē	𐀍 𐀎	Η Η	h (ē)	Η	h	Η	ē	8	Η	ē	8	H	ēta	ἦτα
𐤈	!	9	Θ Θ	th	𐀏 𐀐	Θ Θ	th	Θ Θ	th	Θ	th	9	Θ	th	9	Θ	thēta	θῆτα
𐤉	j	10	Ι Ι	i	𐀑 𐀒	Ι Ι	i	Ι	i	Ι	i	10	Ι	i	10	I	iōta	ἰῶτα
𐤊	k	20	Κ Κ	k	𐀓 𐀔	Κ Κ	k	Κ	k	Κ	k	20	Κ	k	20	K	kappa	κάππα
𐤋	l	30	Λ Λ	l	𐀕 𐀖	Λ Λ	l	Λ	l	Λ	l	30	Λ	l	30	Λ	lambda	λάμβδα
𐤌	m	40	Μ Μ	m	𐀗 𐀘	Μ Μ	m	Μ	m	Μ	m	40	Μ	m	40	M	mū	μῦ
𐤍	n	50	Ν Ν	n	𐀙 𐀚	Ν Ν	n	Ν	n	Ν	n	50	Ν	n	50	N	nū	νῦ
𐤎	s	60				Ξ Ξ	ks	Χ	ks	Ξ	ks	60	Ξ	ks	60	Ξ	ksi	ξῖ
𐤏	o	70	Ο Ο	o	𐀛 𐀜	Ο Ο	o	Ο	o	Ο	ō	70	Ο	ō	70	O	omikron	ὀμικρον
𐤐	p	80	Ρ Ρ	p	𐀝 𐀞	Ρ Ρ	p	Ρ	p	Ρ	p	80	Ρ	p	80	Π	pī	πῖ
𐤑	s	90	Σ Σ	s			s			Ϛ		900			900		(sādhe)*	←
𐤒	q	100	Φ Φ	q		Ϛ Ϛ	q		q	Ϛ		90			90		(qoppa)*	←
𐤓	r	200	Ρ Ρ	r	𐀟 𐀠	Ρ Ρ	r	Ρ Ρ	r	Ρ	r	100	Ρ	r	100	P	rhō	ῥῶ
𐤔	σ	300			𐀡 𐀢	Ξ Ε	s	Ξ Ξ	s	Ξ	s	200	Ξ	s	200	Σ	sigma	σίγμα
𐤕	t	400	Τ Τ	t	𐀣 𐀤	Τ Τ	t	Τ	t	Τ	t	300	Τ	t	300	T	tau	ταῦ
𐤖	w		Υ Υ	u	𐀥 𐀦	Υ Υ	u, ü	Υ Υ	u	Υ	ü	400	Υ	ü	400	Υ	upsilon	ὑψιλον
						Φ Φ	ph	φ φ	ph	Φ	ph	500	Φ	ph	500	Φ	phī	φῖ
			↓ ks		Χ Χ	Χ	kh	χ χ	kh	Χ	kh	600	Χ	kh	600	X	khī	χῖ
						Ψ Ψ	ps		ps	Ψ	ps	700	Ψ	ps	700	Ψ	psi	ψῖ
			⊙ ō		Ω Ω	Ω	ō		ō	Ω	ō	800	Ω	ō	800	Ω	ōmega	ὦμεγα

The Z-shaped KOPPA has been used officially in Greek legislative texts since 1821. Given here is a sample of a text published in 1861; the number shown is 696, where SIGMA-TAU is used in place of STIGMA. According to Stathopoulos, in legislative contexts, the Q-shaped KOPPA is unknown.

Ἄρθρο 75

Με την εισαγωγή του Αστικού Κώδικα καταργείται ο Νόμος Χ4 ΣΤ' της 15/23 Οκτωβρίου 1861 «περί μικτών γάμων».

Mylonas' Euclid fonts contain a range of archaic Greek letters: note capital and small ligature OU, small DIGAMMA, STIGMA, SAMPI, Z-shaped KOPPA, and a DELTA-RHO ligature used in the last century for the measure *drami*, which Mylonas proposes to be used for the DRACHMA SIGN (Macrakis 1996:234).

ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩ
αβγδεζηθικλμνξοπρσςτυφχψω Ϝ Ϛ ϛ ϛ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩϜ
αβγδεζηθικλμνξοπρσςτυφχψω Ϝ Ϛ ϛ ϛ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩ
αβγδεζηθικλμνξοπρσςτυφχψω Ϝ Ϛ ϛ ϛ

The Missing Link

The texts examined show that Q-shaped KOPPA can be found in both alphabetic and numeric contexts, but they do not show Z-shaped KOPPA in alphabetic use at all. What appears to have happened is that Q-shaped KOPPA became written more or less in a single penstroke, and that later the curved bowl of the KOPPA became straightened.

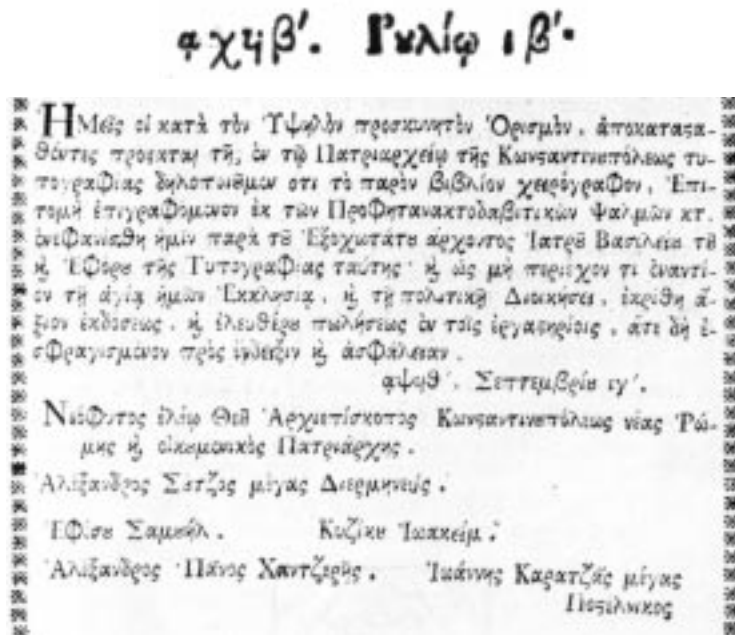
An example of this can be seen in Derolez's 1954 reproduction of a Greek alphabet in a text called *De origine litterarum*, appearing in a set of manuscripts dating from the early 9th century onwards. Though the names of the Greek letters were distorted during the manuscript copying, one can see STIGMA (called EPISINON here) for 65 (VI), a transitional KOPPA (called COFE here) for 90 (LXXXX), and SAMPI (called ENNACOSE here) for 900 (DCCCC).

alfa	beta	gamma	delta	e brevis	epísínon	zeta	eta	theta	
a A	b B	g Γ	d Δ	e Ε	ς	z Z	e Η	th Θ	
I	II	III	IIII	V	VI	VII	VIII	VIII	
iota	kappa	lauta	moy	noy	xi	obrevis	pi	cofe	ro
i I	k K	l Λ	m M	n N	x ξ	o O	p Π	Ϝ	r P
X	XX	XXX	XXXX	L	LX	LXX	LXXX	LXXXX	C
simma	tau	oy	phi	chi	psi	olonga	ennacose	chile	
s C	t T	y Y	f Φ	ch Χ	ps Ψ	o Ω	↑	Ϛ	
CC	CCC	CCCC	D	DC	DCC	DCCC	DCCCC	M	

Note that Ϝ GOTHIC LETTER NINETY and ↑ GOTHIC LETTER NINE HUNDRED were based on the same graphemic model as the original source for *De origine litterarum*.

Perhaps most interesting with regard to the development of Q-shaped KOPPA to Z-shaped KOPPA is the setting of this “open” KOPPA in type, in 17th- and 18th-century Greek texts.

Text reading ,αχϒβ´. Ιουλίου ιβ´. (1692 Ioulio 12), in a bookplate belonging to Chioti Pantaleontos Kalliarchos, Plate 143 (from Κουμαριανος *et al.* 1986). The full sample is shown following.



Text reading ,αψϒθ´. Σεπτεμβρίου ιγ´. (1799 Septemvriou 13), date of the publication of *Επιτομή Αυγουστίνου*, Plate 125 (from Κουμαριανος *et al.* 1986). The full sample is shown following.



Conclusion

Although the Q-shaped KOPPA and Z-shaped KOPPA are identical historically, they have diverged in modern use. Stathopoulos' assertion that Q-shaped KOPPA would not be understood in legislative contexts should be taken seriously, and two new characters, GREEK CAPITAL LETTER NUMERIC KOPPA and GREEK SMALL LETTER NUMERIC KOPPA should be added to the UCS. Although both Q-shaped KOPPA and Z-shaped KOPPA can be found with numeric values, this does not significantly add any ambiguity to the situation, since both SIGMA and DIGAMMA are used with numeric values – and STIGMA would never be used to represent /w/ in early Greek dialect texts. I would consider that glyph-selection techniques (as opposed to character encoding) would not, ultimately, satisfy the user community with regard to these forms (since they do not generally recognize the identity of the characters), and that therefore the new characters should be added to the UCS.

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Annex: A paper by Yannis Haralambous contributing to the discussion.