Hum Gen t (2003) 112 : 255 261
D 10.1007/s00439-002-0874-4

IGI AL I VES IGA I

Ivan Nasidze · Tamara Sarkisian · Azer Kerimov
Mark Stoneking

Testing hypotheses of language replacement in the Caucasus: evidence from the Y-chromosome

: 9 A st 2002 / A t : 23 t r 2002 / u s n n : 14 D m r 2002
S r n r-V r 2002

Abstract A r u s n ss f mtD A r t n nt Cu s s fu n t t In -E r n-s n Arm n ns n u r -s n Az r j n ns r m r s r t n t t t r Cu s s t ns (s Cu s n n s) t n t t r In -E r n r u r ru s, r s t . Arm n n n Az r j n- n t r f r r r s nt n r m nts, ss t m n n n n r m r m m r nts, n s n t r t ns s f Arm n ns n Az r- j n ns s nt - r m s m s u m r s r f t t r n st r t ns s. W t r f r n- z 11 - - r m s m m r rs n 389 m s fr m t t ns, r r s nt n m j r n st ru s n t Cu s s. As t t mtD A st , s nt - r m s m Arm n ns n Az r j n ns r m r s -r t n t t t r r n rs nt Cu s st n t t r n st n - rs s r . H r, r st mtD A r ts s t t Cu s n ru s r m r s r t n t t E r n t n t r E st rn ru s, ntr st t - r m s m s s s r n t r t ns t t r E st t n t E r .

Introduction

Cu s s, t r n t nt C s n n B S s, s r t r z tr m n st r-

s tr tt f r r t m r 506 m ts (Su t Cu s n, rt

s nt t Arm n ns n Az r j n ns r m r s r t n t t t r r n rs nt Cu s s n n t t t r n st n rs s r . In t n, t s s m nstr t t t Cu s n t ns r n t nt rm t t n E r- n n r E st rn t ns, u t tt t r m r s r t t E r n t n t r E st rn - t ns.

n t r ts tu s st t t t t Arm n- n n Az r j n n s r r s nt n r- m nts n t Cu s. r ns f t Arm n n n r su r , u t t Az r j n n s r ntr u n t 11[t] n AD ntr As n n m s (J ns n 1998). A mm n m n sm f n r m nts s t m n n (nfr 1991), r t n f sm n n ru s t t rr s nt t n, t r u s t s m s f r r u s t s ns r s s r t s t n f t n rs. If t n- n ru s r m r m , t n n m t t tt rns f - r m s m r t nt r t ns m tr f t n rs. t st t s t ss f n r-

I. s z (✉) · M. St n n
M n Instut t f r E u t n Ant r ,
Ins str ss 22, 04103 L z , G rm n
.: +49-341-9952505, F : +49-341-9952555,
-m : n s z @ .m

. S r s n
C nt r f M G n t s,
t n A m f S n s f f Arm n ,
5/1 Z n Str., 375010 r n, Arm n

A. K r m
S nt f -r s r Instut t f H m t n r nsf s ,
Az r j n M n st f H t ,
G s Str t 87, B u , Az r j n

m nt t mn n , w r rt r n n y s s f y - r m s m - m r s n t s m s t f Cu s n u t n s r u s y n y z f r m t D A HV1 s q n r t n (s z n St n ng 2001).

Materials and methods

S j ts

A t t f 389 s m s (289 w n 100 sw s) fr mu nr t m n u s w r t n t f - w ng g tu t t nu s u t ns (Fg. 1): G rg ns (Su t Cu s n s rs), Arm n ns (In -Eur n s rs), Az r- j n ns (ur s rs), n A z n ns, K r n ns, In- g s ns, C n ns, n D rg n ns (rt Cu s n s - rs). D A fr m t s m s mu s r u s y fr n y s s f m t D A HV1 s q n r t n n Au ns rt n y m r sms (s z n St n ng 2001; s z t . 2001); sw s fr m t n m s fr m Arm n n Az r j n w r t n r r t n r s t s m s z fr y - r m s m st s. Inf rm ns nt n nf rm t n u t t rt f t n r n t n r's r nts n g r n r- nts w r t n fr m n rs. G n m D A fr m s m s w s tr t u s ng n Is u D A tr t n t (s r , B t , W s ., USA) r n nt n n - r f rm m t (M n nt s t . 1982). D A fr m sw s w s tr t u s ng n nt n s t ng-u t r u r (M r t . 1988). u s y - r m s m s ng n t y m r sm (y -S) t fr m t Su t Cu s s w r u s fr m 25 S ns (G rg), 25 G rg ns fr m K z g (G rg), 12 L z g (Az r j n), n 17 Su t s s t ns (W s t . 2001). A t n u s t n 21 Az r j n ns n 47 Arm n ns (W s t . 2001), n 63 G rg ns (S m n t . 2000; W s t . 2001), n t ff r n m r s, t fr m u r s m s (t n t s w n) n w r n t nu nt n y s s t w g t- ng t r s t s t y n t s u t ns. u s y -S t (S m n t . 2000; W s t . 2001) f r E r n, r E st rn, n C ntr As n u t ns w r s nu .

M u r n y s s

/ n S m r s r u s y r rt t y m r n E r n t r E st (S m n t . 2000) w r y n s m s: S4 (M130), M9, M89, M124, M45, M173, M17, M201, M170, n M172 (n r t . 2000 n r f r n s t r n); t A Au ns rt n y m r sm (H mm r n H r 1995) w s s y . F r S m r s t M130 (S4), / qm n (A- B s st ms) ss s w r s n . r m r s n y - r s w r s n y u s ng r m r E r ss (V r s n 1 f r M - nt s w r C; E B s st ms). r m r n r s q n s r g n n / 1. t n m s w r r r s s r r - u s y (M r n t . 1999). M130 w s y u s ng t y - m r s n r t n/r str t n fr g m nt n t y m r sm r u r s r s w r (K y s r t . 2000), w r s t A Au ns rt n w s y s s r r u s y (H mm r n H r 1995). A s m s w r y fr m r s; n s- r n y w s fu n tw nt r r r f m r s - s r y n r t . (2000) n u r r s ts. / y -S - g ru n m n t r u s r s r ng t t r nt r m- m n t ns f t y C r m s m C ns rtu m (2002). / y - g n t r t n s f t y - r m s m y s, s-

St t st n y s s

H g ru rs y n F_{st} u s w r u t w t Ar q n 2.000 (S n r t . 2000), w w s s u s t r y u t M nt t sts f r r r t ns tw n m tr s. M t m n s n s ng (MDS) n y s s (Kru s 1964) f t F_{st} u s w s r- r u t w t S /A /IS /ICA (St tS ft). r g r m s n HW LI 3.5 (F s nst n 1993) w r u s t nstr t n g r-j n ng tr .0256 /w (A M $_{st}$ u s.

Results and discussion

Y-S gru s nt Cu ss

E n Y-S gru s (Fg. 1) r fu n nt Cu ss (2, Fg. 1). m st frq nt gru s r F*, G* n J2*; t g t r t frq ny f t s t r gru s s 0.53 0.86 n gru s tf r t D rgn ns. D rgn ns g frq ny f gru I* (0.58), s r s fu n t frq ny f 0.1 r ss. S ns r r us r rt (W st . 2001) t g frq ny (0.92) f gru F*, n K z g t g frq ny f gru J2* (0.72). t r gru s ng gru t frq ny r t rt n 0.5, t t n f t sm s m f 12 L z, f r t frq ny f gru F* s 0.58. D rgn ns, L z, S ns, n K z g rr s n ng t st gru rs t s (0.153 0.652), r s f r t t r gru s, t gru rs t s 0.779 0.855.

f t r mm n Cu ss gru s (F* n J2*) r s mm n n r E st rn u t ns L ns , u r s, S r ns (S m n t . 2000), n Ir ns (W st . 2001), t r g frq n s f 0.165 n 0.28, r s t y, u t r s nt n r frq n s n E r (r g frq n s 0.021 n 0.074, r s t y). t r mm n Cu ss gru , G*, s r r n E r (frq ny=0.061) n , nt r E st, s n r rt ny nt u r s n L ns gru s (S m n t . 2000). H gru 1*, s mm n n W st rn n C ntr E r , s r n t Su t Cu ss t frq n s g rt n 0.1, r s nt rt Cu ss, t s snt r n ry s . H gru 1 1*, s r n g frq n s nt su t - st M t rr n n r g n, E st rn E r , n C ntr As , s r s nt t frq ny nt Cu ss, sm r t t r E st. t r Cu ss - gru s u r t frq ny.

D rgn n, S n, n K z g gru s rt u t r s m r t t t r Cu ss gru s. F$_{st}$ u s g st tw n S ns n t r Cu ss gru s (r g F$_{st}$= 0.332), f y t K z g (r g F$_{st}$= 0.286) n D rgn ns (r g F$_{st}$= 0.25), r s t r g rs F$_{st}$ u m ng t r m n ng Cu ss gru s s ny 0.047. s g F$_{st}$ u s, u t t r gru rs t n r u n m r f gru s (2) nt D rgn ns, S ns, n K z g, r m st y t r s t f g nt r ft rt ng n sm s t u t ns.

rr t n tw n t g r n g nt (rs F$_{st}$) st n ss rt ng rs f Cu ss u t ns s n t st t st y s g n f nt (M nt t st: Z = 0.113, *P* =0.671). m f t u t r s (S ns, K z g, n D rgn ns) r s t n rr t n t t s g r u t st n n-s g n f nt (*Z* =0.301, *P* =0.134). t rm n t rt Cu ss Mu nt ns n nfu -

n t st n f r t Su t n rt Cu s s s -
r t y, u t n t r w s st t st y s g n f nt (rt Cu -
s s: Z=0.331, *P* =0.133; Su t Cu s s: Z= 0.346, *P* =
0.65). M r r, t r g F_{st} u t w n Su t n
rt Cu s s u t ns (u ng u t rs) w s
0.075, s m r t t t m ng rt Cu s s u t ns
(0.096) n t t m ng Su t Cu s s u t ns
(0.040). ' r f r, t Cu s s Mu nt ns r n t t
t nfu n nt g nt str ut r f
Cu s s u t ns; nst , g nt r ft r t ng n
sm s t u t ns s ms t m nt t
g nt str ut r f Cu s s u t ns.

C m r s n f Cu s n, E r n, n r E st rn y - g ru s

' g ru rst y nt Cu s s (r g u :
0.797) s m st s g s t t n C ntr As (r g
u : 0.824) n t r E st (r g u : 0.769)
n ss g nf nty g r (*t* -t st, *P* =0.024) t nt -
g ru rst y n E r (r g u : 0.633). An
MDS t n ng r-j n ng tr s n F_{st} u s
(F g. 3A, B) s t E r n u t ns nt W st rn n
E st rn g ru s, s s n s r r u sy (S m n
t . 2000), w t C ntr As n u t ns f ng n -
tw n t W st rn n E st rn E r n g ru s. '
Cu s s u t ns r nt rm ng w t r E st rn
u t ns.

' s tt rns f rt r n nf rm y t r-
w s F_{st} m r s ns; t m n r w s F_{st} u f rt
Cu s s s E r s 0.254, w r st m n F_{st} u
f rt Cu s s st r E st s 0.079, w ss g -
nf nty w r (*t* -t st s n r g F_{st} u s j -
nf r u t ns, *P* <0.001). r g , Su t
Cu s n u t ns r m r s m rt t r E st-
rn n E r n u t ns (r g F_{st}= 0.038 n
0.222, r s t y) t n r rt Cu s n u t ns
(r g F_{st}= 0.097 n 0.303); w r, t t Su t
Cu s s n t rt Cu s s r m r s m rt t
r E st t nt E r w t r s, t t y-S -
g ru s.

' MDS n F_{st} n y s s nu s m g ru s fr m
W s t . (2001) n w t M201 m r r, w s-
t ng s s g ru G* fr m g ru F* (F g. 2),
w s n t n y z (' 2). In t n y s s, t s
n u s w r ss f s g ru F*, t u g
s mu n n wn r rt n u g ru G*. '
t rm n w t r t s n t y t st ng s tw n
g ru s F* n G* f r s m g ru s nfu n t
r s ts f t MDS n F_{st} n y s s, w ss f
g ru G* n u s s g ru F* n r t
t n y s s. ' r s ts (n t s vn) w r ss nt y
nt ; tu s, t n t y t st ng s tw n -
g ru s F* n G* n s m g ru s s n t nfu n
u r nu s ns.

In r rt u n y ss s nur nu -
s ns u s y t sm sz f t s m, s fr m s m
f t g ru s, w r t n y s s ft r u ng
g ru s w t s m, sz ss t n 25 (s ' 2). A
nu s ns r m n t s m (t n t s vn).

G n t r t ns, tw n B sq s n Cu s ns

A mm n r g n f Cu s n n B sq s, rs s

r g rvs F_{st} u tv n B sq s n Cu s n gru s s m g r (F_{st} = 0.563) t n t t tv n B sq s n In -Eur ngru s (F_{st}= 0.311). ' Cu - s s gru s n B sq s r n t u st r t g t r n - t r t n g r-j n ng tr r t MDS t (F g 3A, B). ' s r s ts r n g r m nt v t r u s st s s n ss m r rs n mtD A HV1 s q n t (B rt r t . 1995; s z n St n ng 2001).

L ng g r m nts n g n t r t ns s nt Cu s s

' r s n , n t Cu s s, f gru s v s g - g r n g rs r n t t r ng st n g rs v s u s t r ss t q st n s t v tt r ns t g n t r t ns s f t s gru s: g g r v r n-

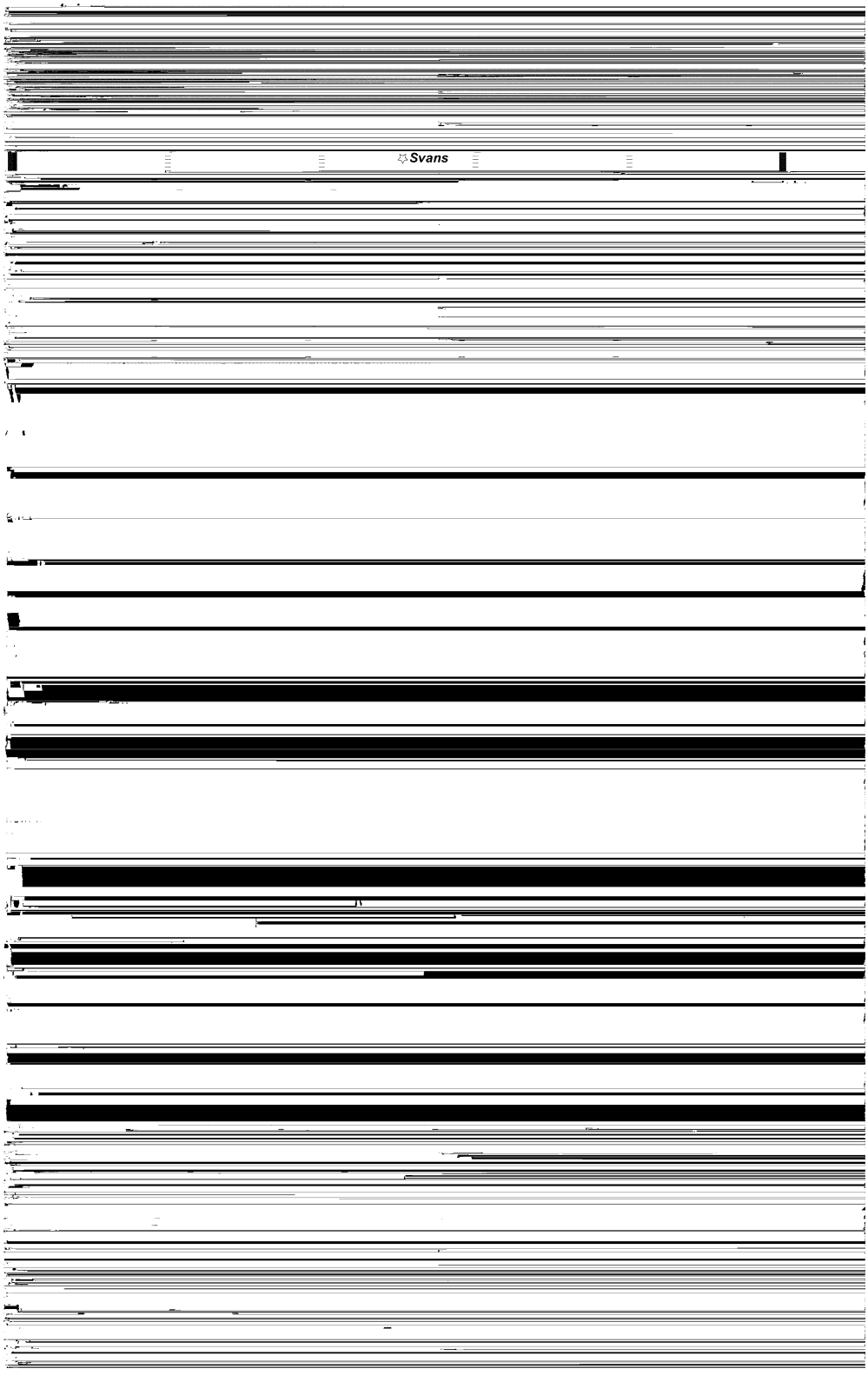

Fig. 3A, B ' y g n t r t ns f - r m s m g ru s, s n 10 -S s n t A m r r. A MDS t s n rw s F$_{st}$ u s, s w ng r t n- s s m ng t Cu s s, E- r n, r E st rn, n C n- tr As n u t ns (*open stars* w t f t u - t n n m s Cu s s g ru s, *closed circles* E r n u - t ns, *open squares* C ntr As n g ru s, *closed diamonds* r E st rn u t ns). ' str ss u f r t MDS t s 0.134. B g r-j n ng tr s n rw s F$_{st}$ - u s f r t s m u t ns (*boldface* Cu s s g ru s)

u r g ru s, r s t y. ' s m y st r f t n t nt r s nt g ru s. C rr nty, t r r m t y m n n s n r , s r s m y t r g n In -E - 8m n Az r j n ns n 3.5m n Arm n ns, t- r n/u r m g r nt g ru s w r y sm n / r t st ng t t r m r r y f t s ng g s fts; n t m t ns y w t t r s nt g ru s. In n s ng -s s fts wu t m s y nt, t m g r nt g ru s n g g n t m t u u r r t r t nm r y g m ns.