

Table S1. Summary of canineCV population parameters estimated using different combinations of population dynamics, molecular clock calibration and type. Time to the most recent common ancestor (in years), evolutionary rates (substitution/site/year) and marginal likelihood estimation results (estimated using Path Sampling (PS) and Stepping Stone (SS) methods) are reported.

Calibration	Clock	Population dynamics	tMRCA	Evolutionary rate	PS	SS
Inner Node Calibration	Strict	Constant	44037.89[95HPD:29026.41-58171.24]	$4.06 \cdot 10^{-6}$ [95HPD: $2.08 \cdot 10^{-6}$ - $5.54 \cdot 10^{-6}$]	-24209,147	-24209,314
		Skyline	44205.96[95HPD:30179.42-59729.17]	$4.03 \cdot 10^{-6}$ [95HPD: $2.77 \cdot 10^{-6}$ - $4.49 \cdot 10^{-6}$]	-24199,822	-24203522
	Relaxed LogNormal	Constant	84252.54[95HPD:38875.07-137000]	$2.911 \cdot 10^{-6}$ [95HPD: $1.50 \cdot 10^{-6}$ - $4.5 \cdot 10^{-6}$]	-23978,267	-23983,544
		Skyline	56615.81[95HPD:37288.85-76060.77]	$3.75 \cdot 10^{-6}$ [95HPD: $2.39 \cdot 10^{-6}$ - $5.31 \cdot 10^{-6}$]	-23976,57	-23977,122
Tip date onlyu	Strict	Constant	187.12[95HPD:112.12-209.51]	$5.67 \cdot 10^{-3}$ [95HPD: $1.88 \cdot 10^{-3}$ - $3.21 \cdot 10^{-3}$]	-24208,941	-24208,276
		Skyline	212.14[95HPD:156.82-268.77]	$8.52 \cdot 10^{-4}$ [95HPD: $6.33 \cdot 10^{-4}$ - $1.08 \cdot 10^{-3}$]	-24184,036	-24186,849
	Relaxed LogNormal	Constant	150.11[95HPD:128.17-202.49]	$2.53 \cdot 10^{-3}$ [95HPD: $1.39 \cdot 10^{-3}$ - $3.77 \cdot 10^{-3}$]	-23961,061	-23963,263
		Skyline	163.03[95HPD:118.58-215.45]	$1.21 \cdot 10^{-3}$ [95HPD: $8.80 \cdot 10^{-4}$ - $1.56 \cdot 10^{-3}$]	-23953,934	-23956,166

Table S2. Summary table of metadata available for the samples included in the present study.

SampleID	Municipality	Forest station	CanineCV	Sex	Age Category	Collection date
FoxVa_1	Brissogne	Nus	Neg.	Female	Adult	2009/2010
FoxVa_2	Charvensod	Aosta	Neg.	Female	Adult	2009/2010
FoxVa_3	Quart	Nus	Neg.	Male	Adult	2009/2010
FoxVa_4	Nus	Nus	Neg.	-	-	2009/2010
FoxVa_5	Saint-Nicolas	Arvier	Neg.	Female	Adult	2009/2010
FoxVa_6	Saint-Nicolas	Arvier	Neg.	Male	Adult	2009/2010
FoxVa_7	Torgnon	Antey-Saint-André	Neg.	Male	Adult	2009/2010
FoxVa_8	Doues	Valpelline	Neg.	Male	Adult	2009/2010
FoxVa_9	Cogne	Aymavilles	Neg.	Male	Adult	2009/2010
FoxVa_10	Courmayeur	Pré-Saint-Didier	Neg.	Female	Juvenile	2009/2010
FoxVa_11	Châtillon	Châtillon	Neg.	Male	Adult	2009/2010
FoxVa_12	Sarre	Aosta	Neg.	Female	Adult	2009/2010
FoxVa_13	Avisé	Arvier	Neg.	Male	Adult	2009/2010
FoxVa_14	Saint-Christophe	Aosta	Neg.	Female	Adult	2009/2010
FoxVa_15	Quart	Nus	Neg.	Female	Adult	2009/2010
FoxVa_16	Sarre	Aosta	Neg.	Male	Adult	2009/2010

FoxVa_17	Torgnon	Antey-Saint-André	Neg.	-	-	2009/2010
FoxVa_18	Sarre	Aosta	Neg.	Female	Adult	2009/2010
FoxVa_19	Gignod	Etroubles	Neg.	Male	Adult	2009/2010
FoxVa_20	Gignod	Etroubles	Neg.	Female	Adult	2009/2010
FoxVa_21	Saint-Rhémy-En-Bosses	Etroubles	Neg.	Male	Adult	2009/2010
FoxVa_22	Morgex	Morgex	Neg.	Male	Adult	2009/2010
FoxVa_23	Pont-Saint-Martin	Pont-Saint Martin	Neg.	Male	Adult	2009/2010
FoxVa_24	Bionaz	Valpelline	Neg.	Female	Adult	2009/2010
FoxVa_25	Arvier	Arvier	Neg.	Female	Adult	2009/2010
FoxVa_26	Quart	Nus	Neg.	Male	Adult	2009/2010
FoxVa_27	Nus	Nus	Neg.	Male	Adult	2009/2010
FoxVa_28	Torgnon	Antey-Saint-André	Neg.	Female	Sub-adult	2009/2010
FoxVa_29	La Salle	Morgex	Neg.	Female	Juvenile	2009/2010
FoxVa_30	Bionaz	Valpelline	Neg.	Female	Adult	2009/2010
FoxVa_31	Quart	Nus	Neg.	Female	Adult	2009/2010
FoxVa_32	Antey-Saint-André	Antey-Saint-André	Neg.	Male	Adult	2009/2010
FoxVa_33	Courmayeur	Pré-Saint-Didier	Neg.	Female	Adult	2009/2010
FoxVa_34	Doues	Valpelline	Neg.	Male	Adult	2009/2010
FoxVa_35	Doues	Valpelline	Neg.	Male	Adult	2009/2010
FoxVa_36	Aosta	Aosta	Neg.	Male	Adult	2009/2010
FoxVa_37	Torgnon	Antey-Saint-André	Neg.	Female	Adult	2009/2010
FoxVa_38	Valtournenche	Antey-Saint-André	Neg.	Male	Adult	2009/2010
FoxVa_39	Charvensod	Aosta	Neg.	Male	Adult	2009/2010
FoxVa_40	Fenis	Nus	Neg.	Female	Juvenile	2009/2010
FoxVa_41	Saint-Denis	Chatillon	Neg.	Female	Adult	2009/2010
FoxVa_42	Challand-Saint-Victor	Verres	Neg.	Male	Adult	2009/2010
FoxVa_43	Valgrisenche	Arvier	Neg.	Male	Adult	2009/2010
FoxVa_44	Cogne	Aymavilles	Neg.	Male	Adult	2009/2010
FoxVa_45	Saint-Rhémy-En-Bosses	Etroubles	Neg.	Male	Adult	2009/2010
FoxVa_46	Quart	Nus	Neg.	Female	Juvenile	2009/2010
FoxVa_47	Ayas	Brusson	Neg.	Male	Adult	2009/2010
FoxVa_48	Saint-Pierre	Villeneuve	Neg.	Female	Adult	2009/2010
FoxVa_49	Quart	Nus	Neg.	Female	Adult	2009/2010
FoxVa_50	Avise	Arvier	Neg.	Female	Adult	2009/2010
FoxVa_51	Saint-Pierre	Villeneuve	Neg.	Male	Adult	2009/2010
FoxVa_52	Pré-Saint-Didier	Pré-Saint-Didier	Neg.	Male	Adult	2009/2010

FoxVa_53	Doues	Valpelline	Neg.	Female	Adult	2009/2010
FoxVa_54	Torgnon	Antey-Saint-André	Neg.	Male	Sub-adult	2009/2010
FoxVa_55	Torgnon	Antey-Saint-André	Neg.	Female	Adult	2009/2010
FoxVa_56	Chatillon	Chatillon	Neg.	Male	Adult	2009/2010
FoxVa_57	Chatillon	Chatillon	Neg.	Male	Adult	2009/2010
FoxVa_58	Nus	Nus	Neg.	Male	Adult	2009/2010
FoxVa_59	La Magdeleine	Antey-Saint-André	Neg.	Male	Adult	2009/2010
FoxVa_60	Brissogne	Nus	Neg.	Male	Adult	2009/2010
FoxVa_61	La Thuile	Pré-Saint-Didier	Pos.	Male	Adult	2009/2010
FoxVa_62	Cogne	Aymavilles	Neg.	Male	Adult	2009/2010
FoxVa_63	Saint-Rhémy-En-Bosses	Etroubles	Neg.	Female	Adult	2009/2010
FoxVa_64	Pollein	Aosta	Neg.	Male	Adult	2009/2010
FoxVa_65	Brissogne	Nus	Neg.	Male	Adult	2009/2010
FoxVa_66	Sarre	Aosta	Neg.	Male	Adult	2009/2010
FoxVa_67	Nus	Nus	Neg.	Male	Adult	2009/2010
FoxVa_68	Valtournenche	Antey-Saint-André	Neg.	Female	Adult	2009/2010
FoxVa_69	Aosta	Aosta	Neg.	Female	Adult	2009/2010
FoxVa_70	Saint Marcel	Nus	Neg.	Female	Adult	2009/2010
FoxVe_1	Cortina D'ampezzo	Pezie	Neg.	Male	Adult	15/09/2017
FoxVe_2	Lorenzago Di Cadore	Pezze Lorenzago Di Cadore	Neg.	Male	Adult	17/09/2017
FoxVe_3	Lorenzago Di Cadore	Pezze Lorenzago Di Cadore	Neg.	Female	Adult	17/09/2017
FoxVe_4	Longarone	Igne	Neg.	-	Juvenile	17/09/2017
FoxVe_5	Tambre	Pian Canton	Neg.	Male	-	24/09/2017
FoxVe_6	Tambre	Rispen	Neg.	Male	-	23/09/2017
FoxVe_7	Pieve D'alpago	Campedel	Neg.	-	-	20/09/2017
FoxVe_8	Tambre	Federa	Neg.	-	-	20/09/2017
FoxVe_9	Chies D'alpago	Comune Di Chies D'alpago	Neg.	Female	Adult	20/09/2017
FoxVe_10	Chies D'alpago	Irrighe	Neg.	Male	Adult	29/09/2017
FoxVe_11	Tambre	Col Indes	Neg.	Male	Adult	28/09/2017
FoxVe_12	Tambre	Pian Canton	Neg.	Female	Juvenile	29/09/2017
FoxVe_13	Pieve Di Cadore	Nonciadize	Neg.	Male	Adult	20/09/2017
FoxVe_14	Alpago	Foran	Neg.	Male	-	04/10/2017
FoxVe_15	Tambre	Ciprian	Neg.	Female	-	04/10/2017
FoxVe_16	Tambre	Pian Canton	Neg.	Female	-	04/10/2017
FoxVe_17	Tambre	Pianon	Neg.	Female	-	02/10/2017
FoxVe_18	Biban	Biban	Neg.	Male	-	02/10/2017

FoxVe_19	Ponte Nelle Alpi	Soccher	Neg.	Male	-	11/10/2017
FoxVe_20	Tambre	Sant'anna	Neg.	Male	-	15/10/2017
FoxVe_21	Tambre	Sant'anna	Neg.	Female	Juvenile	22/10/2017
FoxVe_22	Tambre	Col Indes	Neg.	Female	Juvenile	22/10/2017
FoxVe_23	Medei	Medei	Neg.	Male	Juvenile	28/10/2017
FoxVe_24	Pieve Di Cadore	Nonciarize	Neg.	Female	Adult	07/10/2017
FoxVe_25	Tambre	Pian D'ort	Neg.	Female	Adult	29/10/2017
FoxVe_26	Tambre	Ciprian	Neg.	Female	Adult	01/11/2017
FoxVe_27	Pieve Di Cadore	Col Pian	Neg.	-	Juvenile	18/11/2017
FoxVe_28	Belluno	Secchi	Neg.	Male	Adult	09/12/2017
FoxVe_29	Sedico	Suppiei	Neg.	Male	Adult	09/12/2017
FoxVe_30	Sedico	Peron	Neg.	Male	Adult	06/12/2017
FoxVe_31	Sedico	Suppiei	Neg.	Female	Adult	09/12/2017
FoxVe_32	Sedico	Suppiei	Neg.	Male	Adult	09/12/2017
FoxVe_33	Belluno	Fiume Piave	Neg.	Male	Adult	10/12/2017
FoxVe_34	Tambre	Malolt	Neg.	-	Juvenile	06/11/2017
FoxVe_35	Tambra	Pian Delle Lastre	Neg.	-	Juvenile	06/12/2017
FoxVe_36	Pieve Di Cadore	Nebbiu'	Neg.	Female	Adult	27/11/2017
FoxVe_37	Trichiana	S.Antonio Di Tortal	Neg.	Female	Adult	13/12/2017
FoxVe_38	Trichiana	S.Antonio Di Tortal	Neg.	-	Juvenile	13/12/2017
FoxVe_39	Sedico	Longano	Neg.	Male	Adult	14/12/2017
FoxVe_40	Sedico	Longano	Neg.	Male	Adult	10/12/2017
FoxVe_41	Croda Rossa Belluno	Croda Rossa Nevegal	Neg.	-	Juvenile	17/12/2017
FoxVe_42	Tambre	Col Indes	Neg.	Male	Adult	20/12/2017
FoxVe_43	Comelico Superiore Bl	Dosoleso	Neg.	Male	Adult	18/03/2017
FoxVe_44	Comelico Superiore Bl	Dosoleso	Pos.	Male	Adult	06/02/2017
FoxVe_45	Santa Giustina	Formegan	Neg.	-	Adult	28/01/2017
FoxVe_46	Pedavena	Pedavena	Neg.	-	-	14/04/2017
FoxVe_47	Ponte Nelle Alpi	Col Cugnan	Neg.	Female	Adult	29/04/2017
FoxVe_48	Feltre		Neg.	-	Juvenile	04/06/2017
FoxVe_49	Pescul	<u>Selva Di Cadore</u>	Neg.	Female	Adult	16/05/2017
FoxVe_50	Cornei	Alpago	Neg.	Female	Adult	02/12/2017
FoxVe_51	Punta	Val Di Zoldo	Neg.	Female	Adult	23/10/2017
FoxVe_52	Le Fosse	Peron	Neg.	Female	Adult	06/12/2017
FoxVe_53	Curva Del Cristo	Belluno	Neg.	Female	Adult	17/01/2018
FoxVe_54	Valzella		Neg.	Female	Sub-adult	31/01/2018

FoxVe_55	Alpago	Valde	Neg.	Female	Adult	21/01/2018
FoxVe_56	Tambre	Malolt	Neg.	Female	Adult	14/01/2018
FoxVe_57	Tambre	Franamento Valturca Na	Neg.	Female	Adult	21/01/2018
FoxVe_58	Alpago	Tomas	Neg.	Female	Adult	21/01/2018
FoxVe_59	Farra D'alpago	Tomas	Neg.	Female	Adult	21/01/2018
FoxVe_60	Belluno	Antore	Neg.	Male	Adult	25/01/2018
FoxVe_61	Tambre	Pian Grant	Neg.	Male	Juvenile	24/09/2018
FoxVe_62	Puos D'alpago	Romascienz	Neg.	Male	Adult	25/01/2018
FoxVe_63	Puos D'alpago	Malolt	Neg.	Male	Adult	28/01/2018
FoxVe_64	Puos D'alpago	Malolt	Neg.	Male	Adult	28/01/2018
FoxVe_65	Puos D'alpago	Malolt	Neg.	Female	Adult	28/01/2018
FoxVe_66	Colle Santa Lucia	Passo Giau	Pos.	Male	Adult	08/10/2018
FoxVe_67	Belluno	Visome	Pos.	Male	Adult	04/01/2018
FoxVe_68	Belluno	Visome	Pos.	Female	Adult	04/01/2018
FoxVe_69	Belluno	Visome	Neg.	Female	Adult	04/01/2018
FoxVe_70	Cesiomaggiore	Calliol	Neg.	Female	Adult	11/10/2018
FoxVe_71	Lentiai	San Gervasio	Neg.	Female	Juvenile	01/11/2018
FoxVe_72	Comelico Superiore	Selvapiana	Neg.	Male	Adult	21/10/2018
FoxVe_73	Tambre	Federa	Neg.	Male	Adult	17/11/2018
FoxVe_74	Tambre	Pianon	Neg.	Male	Adult	23/11/2018
FoxVe_75	Comelico Superiore	Pista Pies	Neg.	Male	Adult	30/01/2018
FoxVe_76	Domegge Di Cadore	Ranzenigo	Neg.	Male	Adult	17/11/2018
FoxVe_77	Lentiai	Salet Di Sotto	Neg.	Male	Adult	16/12/2018
FoxVe_78	Cencenighe Agordino	Malos	Neg.	Male	Adult	14/12/2018
FoxVe_79	Comelico Superiore	Pian Formaggio	Neg.	Male	Adult	12/12/2018
FoxVe_80	Tambre	Federa	Neg.	Male	Adult	15/12/2018
FoxVe_81	Alpago	Poiatte	Neg.	Female	Adult	31/01/2018
FoxVe_82	Puos D'alpago	Le Rive	Neg.	Female	Adult	09/02/2018
FoxVe_83	Puos D'alpago	Le Rive	Neg.	Female	Adult	31/01/2018
FoxVe_84	Cavessago	Cavessago	Neg.	Female	Adult	01/03/2018
FoxVe_85	Belluno	Cirvoi	Neg.	Male	Adult	30/12/2017
FoxVe_86	Farra D'alpago	Coste	Neg.	Male	Adult	31/12/2017
FoxVe_87	Tambre 32010	Sant'anna	Neg.	Female	Adult	31/12/2017
FoxVe_88	Tambre	Manteo	Neg.	Male	Adult	03/01/2018
FoxVe_89	San Pietro In Campo	San Pietro In Campo	Neg.	Male	Adult	30/12/2017
FoxVe_90	San Pietro Di Cadore	San Pietro Di Cadore	Neg.	Male	Adult	23/12/2017

FoxVe_91	San Pietro Di Cadore	Schiaron	Neg.	Male	Adult	23/12/2017
FoxVe_92	San Pietro Di Cadore	Via Pier Fortunato Calvi	Neg.	Male	Adult	20/09/2017
FoxVe_93	Cesiomaggiore	Bordugo	Neg.	Male	Adult	20/09/2017
FoxVe_94	Livinallongo Del Col Di Lana	Varda	Neg.	Male	Adult	06/04/2018
FoxVe_95	Fonzaso	Ai Giaroni	Pos.	Male	Adult	14/01/2018
FoxVe_96	Tambre	Sant'anna	Neg.	Male	Adult	13/01/2018
FoxVe_97	Alpago	Spert	Neg.	Male	Adult	14/01/2018
FoxVe_98	Alpago	Spert	Neg.	Female	Adult	14/01/2018
FoxVe_99	Farra D'alpago	Poiatte	Neg.	Male	Adult	23/12/2017
FoxVe_100	Farra D'alpago	Coste	Neg.	Male	Adult	23/12/2017
FoxVe_101	Tomas	Farra D'alpago	Neg.	Male	Adult	07/12/2019
FoxVe_102	Poiatte	Alpago	Neg.	Female	Adult	07/12/2019
FoxVe_103	Spert	Alpago	Neg.	Female	Sub-adult	26/01/2020
FoxVe_104	Valmaor	Chies D'alpago	Neg.	Male	Adult	26/01/2020
FoxVe_105	San Daniele	Chies D'alpago	Neg.	Male	Adult	26/01/2020
FoxVe_106	Val Maor	Chies D'alpago	Neg.	Male	Adult	26/01/2020
FoxVe_107	Le Ronche	La Valle Agordina	Neg.	Female	Juvenile	29/05/2020
FoxVe_108	Rufane	Puos D'alpago	Neg.	Male	Sub-adult	26/01/2020
FoxVe_109	Poiatte	Alpago	Neg.	Female	Sub-adult	19/01/2020
FoxVe_110	Tomas	Farra D'alpago	Neg.	Female	Adult	12/01/2020
FoxVe_111	Prese	Alpago	Neg.	Male	Adult	12/01/2020
FoxVe_112	Col Indes	Tambre	Neg.	Female	Adult	05/01/2020
FoxVe_113	Foran	Alpago	Neg.	Male	Adult	05/01/2020
FoxVe_114	Pianture	Farra D'alpago	Neg.	Male	Adult	05/01/2020
FoxVe_115	Col Indes	Tambre	Neg.	Female	Adult	17/10/2020