Palaeo-Zoology. — *On the Oldest Domestic Animal and its significance for Palethnology.* By A. E. VAN GIFFEN. (Communicated by Prof. J. F. VAN BENMELEN.)

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This paper records the first results of a lengthy and time-consuming inquiry regarding pre-, and proto-historical domestic animals, notably dogs, which, at all events, in Europe, seem indeed to be the oldest companions of man.

One of the earliest known domestic animals is *Canis palustris*, acknowledged as such by RÜTIMEYER. Besides this we have since that time gathered much information concerning other prae-, and proto-historical forms from the works of JEITTELES, WOLDRICH, STROBEL, TROUESSART, STUDER, KELLER, WINGE, HILZHEIMER, BRINKMAN, etc., etc. I mention only:

Canis palustris ladogensis Anutschin
Canis inostranzewi Anutschin
Canis matris optimae Jeitteles
Canis intermedius Woldrich
Canis mikii Woldrich
Canis spalletti Strobel
Canis de le Mirei Hue
Canis leineri Studer
Canis putiatini Studer
Canis intermedius newelskii Brauner
Canis kryschtofovitschi Brauner
{ Canis decumanis Nehring } (Roman)
{ Canis molossus Kraemer }

When at the time of the commencement of my investigation of the "Terpen" [1]) in the year 1908 I was confronted with a large number of proto-historical remains of domesticated animals I was desirous to examine the material by a similar method to that adopted by RÜTIMEYER in his research of the fauna of the Swiss lake-dwellings. This not only facilitated my efforts, it also placed at my disposal a number of so-called standard types. But at the time the result of those efforts consisted only of a thesis entitled "Die Fauna der Wurten". The title is disappointing, as it suggests much more than the contents impart, so the addition "Teil I" on the title page is everyway justifiable. However, the fact is that "Teil II" has never

[1]) "Terpen" = the artificial protohistorical hills in the low lands along the shores.

appeared, although I may apologize by adding that I have been busy at it, and have already gathered some material for it.

It is into this material that I wish to make a dip now.

How was it that the study of the domesticated "Terpen"-fauna was retarded so long, in spite of the masterly work done by RÜTIMEYER, and notwithstanding the establishment of the above-named standard-types, and even despite the increase of our knowledge of domestic animals. It stands to reason that various factors may have come into play here, as e.g. pursuits in another direction, irrelevant private circumstances, difficulties in appreciating osteometrical researches, arising from the altered views in the genetic domain, etc., etc. It would not do, however, to ascribe this neglect to lack of interest. The contrary is the fact.

The true and primary cause of the retardation of the results of the early specific study of domestic animals must be looked for in the overwhelming mass of avaible material and the doubtful significance of the standard-type, as well as in the selection of the special domestic animal for a first treatment, i.e. the dog.

Before long I had the disposal of a few hundreds of skulls from a large variety of dogs, not to mention other skeletal parts. The standard-types mentioned appeared not to be adequate for the determination of these bones. Moreover the border values of the latter, and the features considered as typical of them, appeared to give rise to the greatest difficulties.

All sorts of differences between those types could be removed by help of that new material, whereas a number of forms lay quite beyond the limits assigned by them.

All this, added to the knowledge that identity of phenotype does not warrant identity of genotype, made me look out for another working-method.

A lecture by Prof. J. W. MOLL on Darwinism and experimental systematics in 1909 induced me to study the material systematically, in which efforts I was constantly encouraged by Prof. J. F. VAN BEMMELEN. I feel specially indebted to him for enabling me to carry out a new investigation of the Swiss lake-dwellings.

We refrained from a determination of the available forms piecemeal, and worked the material "en masse", i.e. the population as a whole, i.c. a group of domesticated animals, typical of the first half of our era. It seemed to me that it would be interesting for the solution of questions about origin and affinity, if we could work and compare such groups, as they are also characteristic of other regions and of other times. Therefore I will make a dip into the studied material, for if this working-method and the conception underlying it, should be right, it might just as physico-anthropological, prehistoric-archaeological, philological and other methods do, furnish an independent series of supplemental and also partly new data for an insight into the palethnological problems. If I am not mistaken this has already been shown.

A comparative, and sofar as was possible, a statistic study was made of the results of our investigation and measurement of three large populations of dogs and of one smaller one, viz.

a. from the Frisian and Groningen "Terpen" of the late iron-age ;

b. from the neolithic, and bronze-age Swiss lake-dwellings ;

c. from the mesolithic Danish-Cimbric Kjøkkenmøddingen, and

d. from the neolithic-megulithic settlement of Flintholm in the island of Alsen.

For the sake of comparison we also studied recent dogs, as well as their recent and less recent relations, to be found exclusively in the neighbourhood of Thooiden, the wolves and the jackals, from various regions.

Broadly outlined the results are provisionally to the following effect :

1. The terp-dogs inter se display much smaller divergencies than the recent dogs. A later increase is quite ascribable to the bulldog- resp. pug-type on the one side, and the greyhound on the other. The indices imply a predominence at the time of large bulldogs, hounds, and the like in our parts. Huge, greyhound-like forms of Leineri-, resp. "Deerhound"-type, were, however, represented among them. They betray much wolf's blood.

2. When compared with the dogs from the lakedwellings the Terp-dogs reveal an enormous increase of divergencies. The lacustrinc dogs themselves can be split up into two groups, (double-topped curves with more than fifty characteristics). They are a large group of smaller dogs, and a small group of larger dogs. To the former belong C. palustris, C. de le merei, and C. spalletti, to the latter C. matris optimae, C. leineri, C. inostranzewi, while C. intermedius is to be grouped under the latter for one characteristic, and under the former for another. Furthermore it has appeared that the small group of larger dogs is absent in lakedwellings with pure stone-cultures, while the palustris group characteristic of it shows fewer variations, or rather smaller differences than those of the lake-dwelling-culture, as a whole. For the rest as regards the facioneurocranium-length-index, and the neurocranium-width-index, the small group behaves like the jackals, but the large group like the wolves.

3. The Kjøkkenmøddinger dogs when compared with the dogs from the lakedwellings collectively, even with those from the some-age, exhibit on the contrary a considerable decrease of divergencies. Apart from the possibility that they also admit of a division into two groups, just as the arctic dogs, their divergencies agree completely with those of the palustris group of the lake-dwelling of the stoneage. They are isomorphous inter se, and on an average not only larger than the latter, but also larger than the well-known European jackal-forms.

4. Compared with the dogs from the lake-dwellings, and with the Kjøkkenmøddinger-dogs the Cimbric-megalithic dogs bear a great resemblance to the latter.

To express this more distinctly I may be allowed to report here a single

variability-coefficient, more particularly "Streuungs"-coefficient, namely $C = 100 \times \frac{\sigma}{M^2}$. In this way we can demonstrate more or less the divergencies that increase gradually with age. The coefficient in question is namely for the length of the praemolars (III—IV = 27), the molars + cuspid (I—III = 28), the molars (II—III = 29), and of the cuspid ($PM\frac{4}{1} = 56$) superior, resp. for those of the base of the jaw (ba = 62), the row of molars (III—IV = 66), the three molars (I—III = 67), the two posterior molars (II—III = 68), and of the cuspid ($M\frac{}{1} = 78$), for the above-named canine populations, successively :

Characteristic :	Dogs from the			
	"Terps"	Lakedwellings		Kjøkken-møddinger
		together	stone age	
III—IV = 27	12.^{4}	8.^{2}	7.^{2}	—
I—III = 28	—	8.^{3}	7.^{5}	6.^{2}
II—III = 29	11	9.	8.^{4}	7.
$PM\frac{4}{1}$ = 56	10.^{2}	9.^{5}	8.^{2}	5.^{4}
ba = 62	17.^{4}	12.^{2}	8.^{5}	3.^{6}
III—IV = 66	—	12.^{3}	7.^{6}	4.^{2}
I—III = 67	—	9.^{5}	6.^{4}	5.^{7}
II—III = 68	—	12.^{4}	9.^{8}	4.^{5}
$M\frac{}{1}$ = 78	—	10.^{6}	6.^{6}	6.^{1}

From the available comparable statistic results we may, to my thinking, conclude already now :

1. in particular:

a. that the Canis de le mirei of the French lake-dwellings is not a type of itself, but belongs to the palustric-group ;

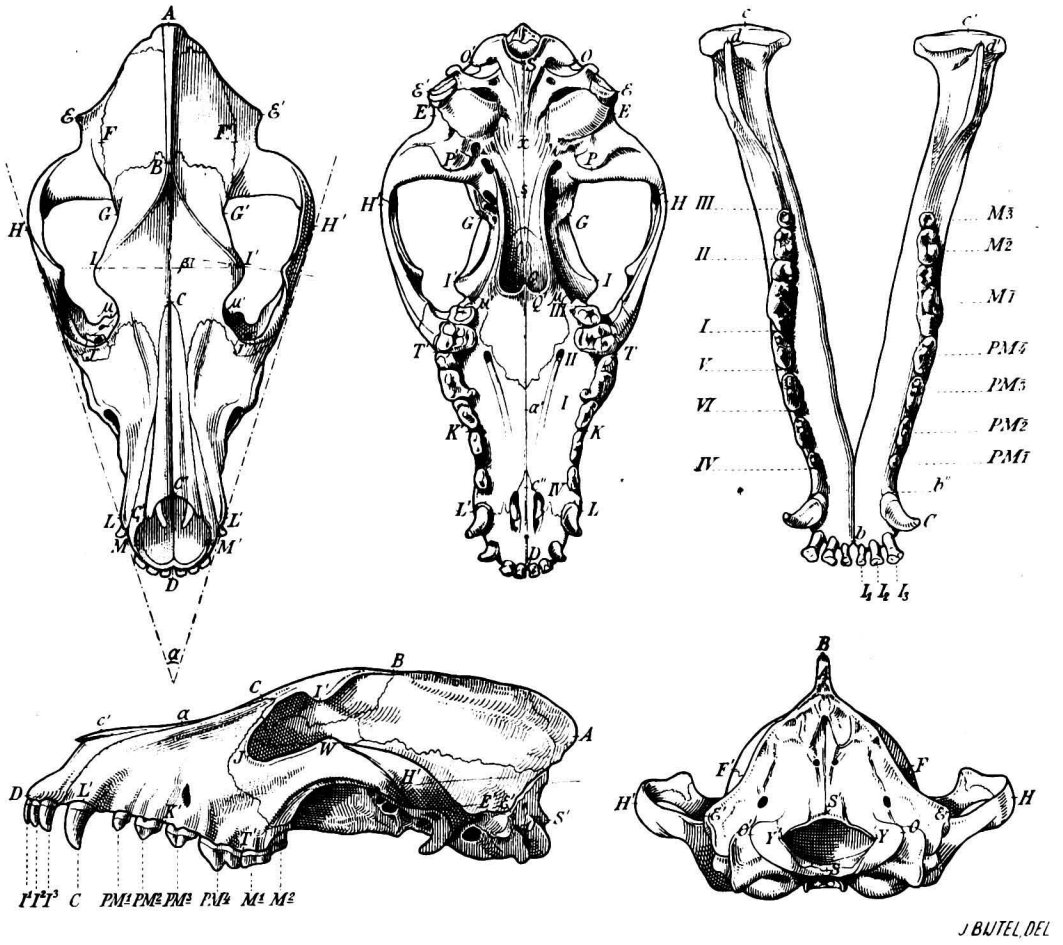
b. that the dog of the at all events typological, meso- and neolithic culture of Ryckholt—St. Geertruid, does not belong to the palustris-group, but to the group of larger dogs, which elsewhere do not appear before the lake-dwellings of the bronze age.

2. in general:

a. that e.g. earliest known Asiatic dogs (Anau in Turkestan) do not belong to the *palustris-*, but to the *matris optimae-* (wild form Canis pallipes Sykes) type ;

b. that the earliest known European (i.e. Kjøkkenmøddinger) dogs

Localization of the measurements. PLATE 1



differ very little mutually ; that they have nothing to do with the well-known analogous Asiatic or African dogs ; that they do not descend from the Canis palustris of the lakedwellings ; but that they may be the progenitors of the prae-historic, Cimbric-megalithic (and recent arctic) dogs, while conversely it is difficult to derive them from a European, neither to non-European jackals. They represent either a Canis verus, a "chien sui generis", or descendants from a small wolf of which we know nothing in particular.

The research for the place of origin, and the descent of these dogs must be of paramount importance for palethnology.

Whatever may be the significance of the objective facts memorized, one thing at which I hinted at the outset, is distinctly coming to the fore, namely, that it imports us to know what results would be yielded by a comparable statistic study of other than the prehistoric groups, named

Lakedwelling Dogs.

Characteristic CC' = 3
Length nasal bone

		Interval	Number	Frequency	Portion belonging to the pure stone-culture: Number	Frequency	Procentic number of all lacustrine dogs
●	Stone	44⁵–47⁴	5	5.55	5	10.87	5.55
✳	Copper	47⁵–50⁴	14	15.60	4	8.70	4.44
△	Bronze	50⁵–53⁴	19	21.10	13	28.26	14.46
● ✳	Stone-copper	53⁵–56⁴	20	22.20	9	19.56	10.00
● △	Stone-bronze	56⁵–59⁴	12	13.35	6	13.07	6.67
● ✳ △	Stone-copper-bronze	59⁵–62⁴	9	10.00	6	13.07	6.67
		62⁵–65⁴	5	5.55	1	2.17	1.11
		65⁵–68⁴	3	3.33	1	2.17	1.11
		68⁵–71⁴	1	1.11	1	2.17	1.11
		71⁵–74⁴	1	1.11			
		74⁵–77⁴	0	0.00			
		77⁵–80⁴	0	0.00			
		80⁵–83⁴	1	1.11			
		Total	90	100.01	46	100.01	51.11 %

155
149 148
128 140
123 139
104 127
91 121
111 88 120
110 73 114
95 70 108 122
94 69 102 112
87 67 90 107
68 65 64 103 A4
17 63 50 97 150
16 49 42 89 142
12 48 29 62 137
156 9 44 26 38 99 A
147 8 30 25 37 45 125
105 3 22 7 31 39 100 E8
41 2 18 6 23 27 92 C1
36 1 11 4 10 20 75 A2 C3 C2 D1

44⁵ 47⁵ 50⁵ 53⁵ 56⁵ 59⁵ 62⁵ 65⁵ 68⁵ 71⁵ 74⁵ 77⁵ 80⁵
47⁴ 50⁴ 53⁴ 56⁴ 59⁴ 62⁴ 65⁴ 68⁴ 71⁴ 74⁴ 77⁴ 80⁴ 83⁴

	Group I	Group II	
Minimum Variant	45	67	A ● 64
Maximum Variant	66	83	

	M	Q^o	Q^p	Q^1	Q^2	$\frac{Q}{M} = \frac{Q^1+Q^2}{2M}$
All together	54,55	51,05	58,87	3,50	4,32	0,072
Group stone age	53,67	51,08	58,25	2,59	4,58	0,067
Group C. palustris	54,17	50,82	57,75	3,35	3,58	0,064

	Minimum	Maximum
Group I	45	66
Canis aureus	45	56 (61)
Canis lupus	71	93
Group II	67	83
Terpdogs	23	93

[y] *E1 K2 E2 A' A1 D* [xy]
E3 K7 K8

[x] $K_1 = 43\ m\ M$

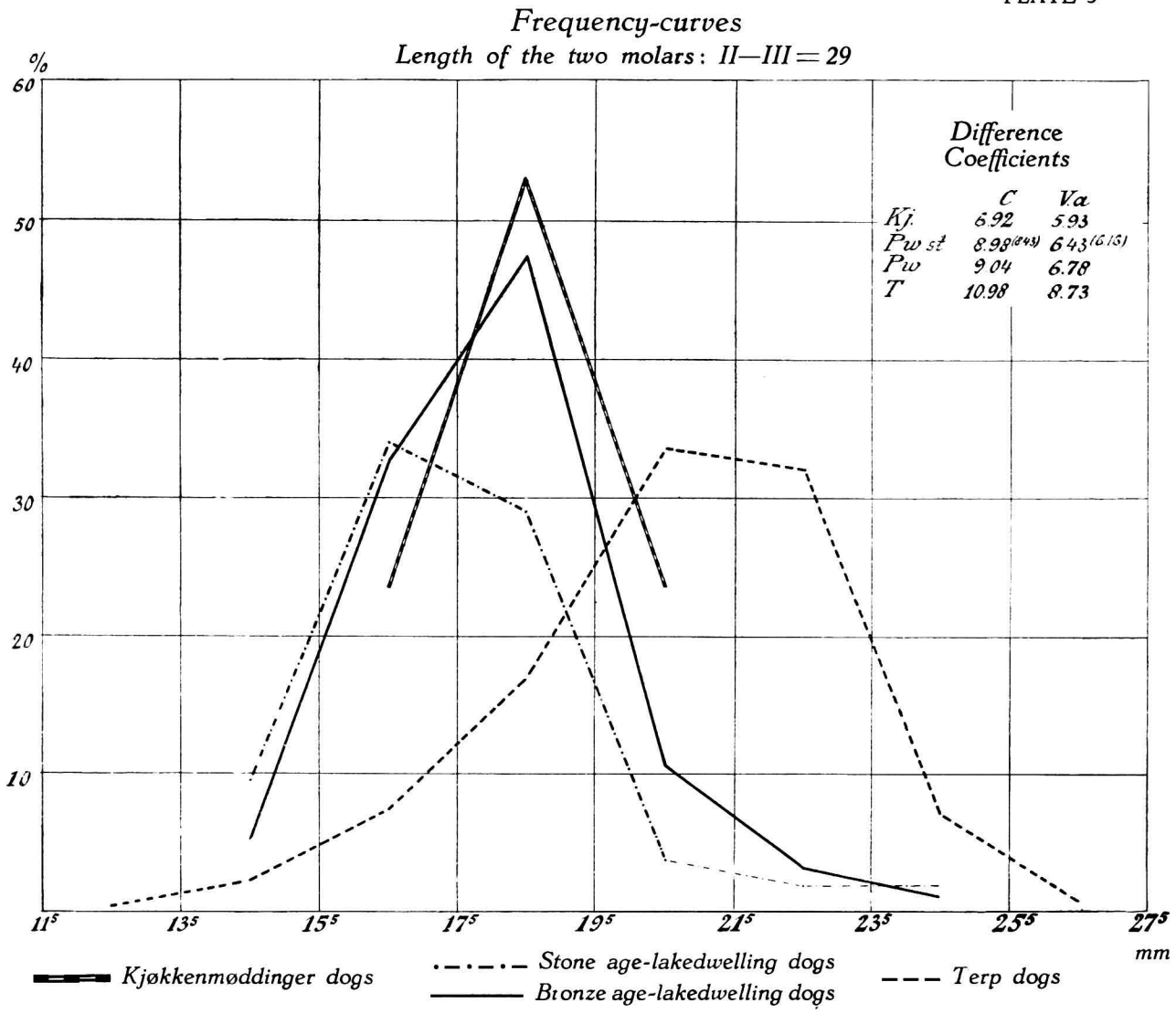
[xy] $I_2 = 95\ m\ M$

	after Rütimeyer		Values found
Width of variation	47–58		45–66
Arithm. means	52^5	*M*	54,17

N.B. Number [1]) with A = Canis matris optimae JEITTELES.
" " B [2])= " palustris RÜTIMEIJER.
" " C = " inostranzewi ANUTSCHIN.
" " D = " leineri STUDER.
Number with E = Canis intermedius WOLDRICH.
" " K = " spalletti STROBEL.
" " I = " decumanis NEHRING.

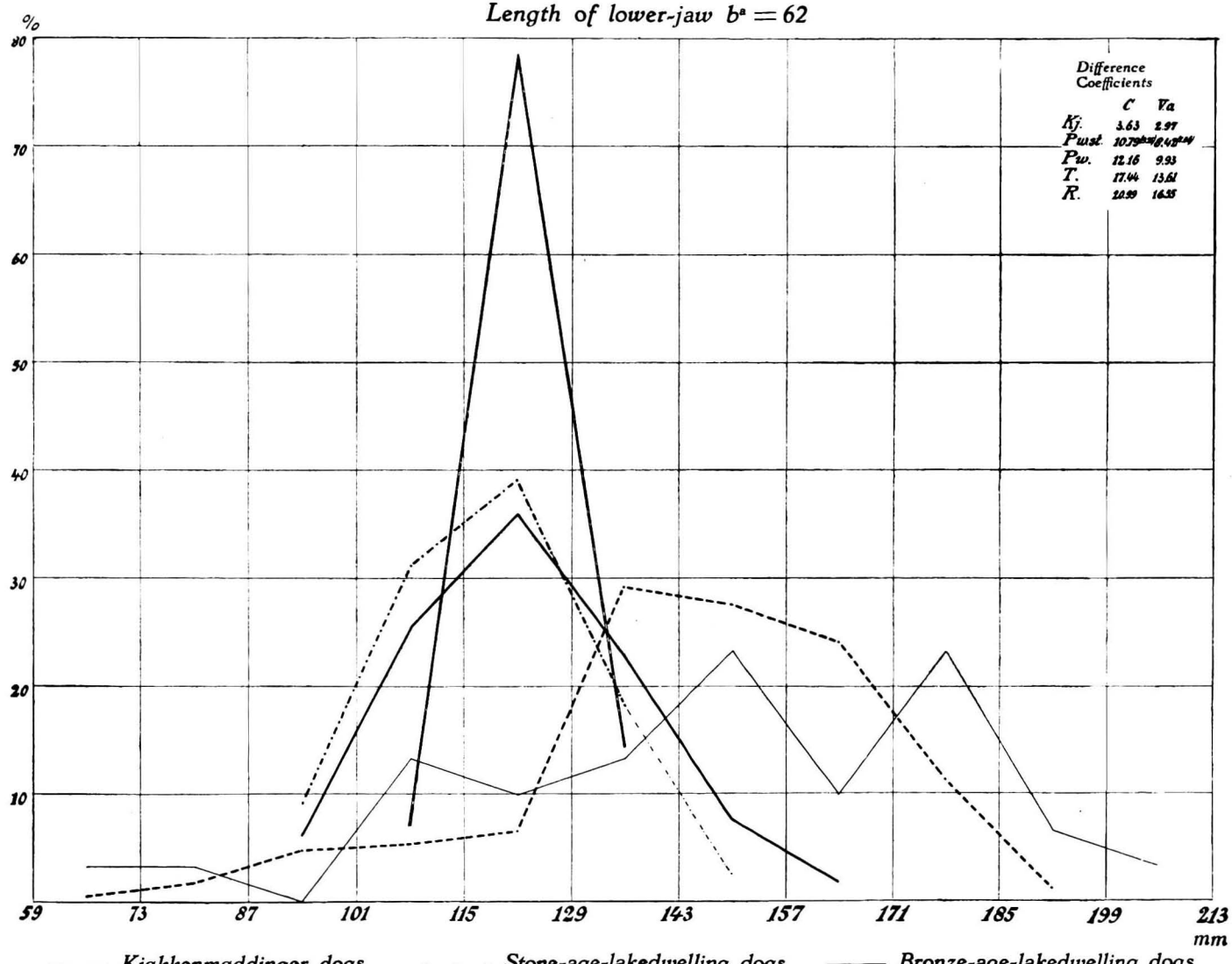
[1]) These numbers refer to those in the catalogue of the remains of dogs in the different Swiss collections as described or measured by the writer.

[2]) Since the greater part consists of Canis palustris, the letter B is omitted.


Frequency-curves
Length of the two molars: II—III = 29
%
60
50
40
30
20
10
11⁵
13⁵
15⁵
17⁵
19⁵
21⁵
23⁵
25⁵
27⁵
mm
Difference Coefficients
C
Va
Kj. 6.92 5.93
Pw st 8.98(6.43) 6.43(6.15)
Pw 9.04 6.78
T 10.98 8.73
Pw.st. = Ldw.st.
Pw = Ldw.
Kjøkkenmøddinger dogs
Stone age-lakedwelling dogs
Bronze age-lakedwelling dogs
Terp dogs

Frequency-curves

Length of lower-jaw $b^a = 62$



Statistic comparative review of the characteristics: length of lower-jaw-, and tearing molars of the oldest housedogs and those of their nearest wild relations.

ba = 62

																			Medians
Jackals																			Kjøkkenmøddinger dogs 123.7
																			Stone age-Lakedw. dogs 117.9
South-Asia		2	12	8	1														Jackals: Europe 117.0
Minor-Asia		2	13	11	3														Jackals: Africa 117.0
Africa		1	14	12	7	2	1												Jackals: Minor-Asia 115.2
Europe (S. E.)		1	5	7	2														Jackals: Mesopotamia etc. 113.5
INTERVAL:	94^5	101^5	108^5	115^5	122^5	129^5	136^5	143^5	150^5	157^5	164^5	171^5	178^5	185^5	192^5	199^5	206^5	mm	
Wolves																			
Europe											3	1	11	10	6	2	3		numbers
Diluvium Europe												2							numbers
Asia								1		1	1	1							numbers
Oldest dogs																			
Kjøkkenmøddinger				111		120^4	123^8	127^5	132										Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Stone age-Lakedwellings	95		108^4		117^2		126^1				157								Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Peat-findings Denmark				1		1		2	6	5	5	8	2	number					

PM^4 = 56

																			Medians
Jackals																			Kjøkkenmøddinger dogs 16.9
																			Stone age-Lakedw. dogs 16.9
South-Asia		4	7	10	3														Jackals: Europe 16.5
Minor-Asia		4	8	14	5														Jackals: Africa 17.1
Africa		3	4	12	12	4	3	1											Jackals: Minor-Asia 16.5^5
Europe (S. E.)			6	7	2														Jackals: Mesopotamia etc. 16.4^5
INTERVAL:	14^3	15^3	16^3	17^3	18^3	19^3	20^3	21^3	22^3	23^3	24^3	25^3	26^3	27^3	28^3	29^3		mm	
Wolves																			
Europe								2	5	4	6	9	7	3	1				numbers
Diluvium Europe						(1)		1				2	4	2					numbers
Asia							1	1	2	1	1								numbers
Oldest dogs																			
Kjøkkenmøddinger		15^5	16^{05}	16^9	17^6		19^2												Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Stone age-Lakedwellings	15		16^{15}		17^2		18^5		21										Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Diluvial dogs																			
Gaillenreuth. G 32						(20)													
Peat-findings Denmark				2	2	7	9	6		4	number								

M_1 = 78

																			Medians
Jackals																			Kjøkkenmøddinger dogs 20.5
																			Stone age-Lakedw. dogs 19.8
South-Asia			10	13															Jackals: Europe 17.3
Minor-Asia	8		8	18	3														Jackals: Africa 19.1
Africa	1		6	22	8	1	1												Jackals: Minor-Asia 18.8
Europe (S. E.)			9	5	1														Jackals: Mesopotamia etc. 18.6
INTERVAL:	14^5	16^5	18^5	20^5	22^5	24^5	26^5	28^5	30^5	32^5								mm	
Wolves																			
Europe							6	15	14	6									numbers
Diluvium Europe								1	6	8									numbers
Asia						1	2	2											numbers
Oldest dogs																			
Kjøkkenmøddinger			17^8	19^5	20^{45}	21^4		24											Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Stone age-Lakedwellings			17^3	18^6	19^7		20^8	22^5											Explanation: — min. variant = Ma ≡ Q_a^p — Q_a^0
Peat-findings Denmark				1		17		17		1	number								

before, especially of Southern and Western Europe on the one side and Western Europe on the other. If we had comparable curves also of those types, I feel convinced that the solution of the palethnological problems would be largely benefited. It is my firm conviction that to this end it will be first of all required to make a careful collection, (too often neglected) of the often ignored prae-, and protohistorical bones of domesticated animals, and that international co-operation will be of inestimable value. My conviction is based on the statistic results obtained, especially curves, differences in width, medians quartiles and variation coefficients. I here refer to the diagrams and the tables. (Plate I—V.)