

*Bison priscus* (Bojanus)

*Buffelus murrensis* Berckhemer

65. Steinheim III (Murr), West Germany  
(For references, see Steinheim I, Number 35)  
"Main Mammoth gravels"

Carnivora

*Canis lupus* Linnaeus

*Panthera* cf. *leo* (Linnaeus)

*Ursus spelaeus* Rosenmüller and Heinroth

Proboscidea

*Mammonteus trogontherii* (Pohlig)

*Mammonteus primigenius* (Blumenbach)

Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

*Equus steinheimensis* von Reichenau

Artiodactyla

*Megaloceros giganteus* ssp.

*Cervus elaphus* Linnaeus

*Bison priscus* (Bojanus)

C. Eastern Province

66. Schönebeck (Elbe River), East Germany  
(Schertz 1936, 1937)

Proboscidea

*Palaeoloxodon antiquus* (Falconer)

Perissodactyla

*Equus* sp.

Artiodactyla

*Cervus elaphus* ssp.

*Bison priscus* (Bojanus)

*Buffelus wanckeli* Schertz

67. Ördöglyuk (Solymár, Budapest), Hungary  
(Kretzoi 1933, 1944, 1956; Vértés 1950; Jánossy, 1969)

Carnivora

*Canis lupus* Linnaeus

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)

*Equus* sp.

Artiodactyla

*Cervus elaphus* ssp.

*Alces brevirostris* Jánossy

68. Sindomic (Intra-Carpathian Basin), Romania  
(Samson and Radulesco 1969)

Carnivora

*Ursus spelaeus* Rosenmüller and Heinroth

Perissodactyla

*Coelodonta* cf. *antiquitatis* (Blumenbach)

*Equus* cf. *steinheimensis* von Reichenau

*Equus* sp.

Artiodactyla

*Cervus elaphus* Linnaeus

*Rangifer tarandus* (Linnaeus)

*Bison* cf. *priscus* (Bojanus)

69. Drăghici (Muntenia), Romania  
(Athanasiu 1914; Samson and Radulesco 1968)

Carnivora

*Hyaena* sp.

*Homotherium* cf. *moravicum* (Woldřich)

Artiodactyla

*Sus scrofa* Linnaeus

*Cervus* cf. *elaphus* Linnaeus

*Dama* sp.

*Bison* cf. *schoetensacki* Freudenberg

70. Tusnad-Sinmartin (Intra-Carpathian Basin), Romania  
(Samson and Radulesco 1969)

Proboscidea

*Mammonteus trogontherii* (Pohlig) progressive type

*Mammonteus primigenius* (Blumenbach) primitive type

Perissodactyla

*Equus* sp.

## Artiodactyla

*Bison priscus* (Bojanus)

71. Sfintu-Gheorghe, Malnas, Bodoc, and Ghindfalau (Braşov), Romania (Jekelius 1932; Poovici 1959; Radulesco, Samson, Mihaila, and Kovács 1965; Liteanu, Mihaila, and Bandrabur 1962; Samson and Radulesco 1963, 1965, 1968; Alimen, Radulesco, and Samson 1968)

## Proboscidea

*Mammonteus trogontherii* (Pohlig) progressive type*Mammonteus primigenius* (Blumenbach) primitive type

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)*Equus steinheimensis* von Reichenau*Equus* sp.

72. Khazar faunal complex (Volga River), USSR (Gromov 1948; Nikiforova 1960; Vasilyev 1961; Fedorov 1961; Alexandrova 1965)

In this faunal complex we have the representatives of a relatively long faunal sequence including the uppermost parts of the Great Interglacial Period (Mindel/Riss of the alpine sequence), as well as the Riss (= Saale) glacial complex. In recent publications this faunal complex has been divided into a lower and an upper Khazar complex (Vasilyev 1961; Fedorov 1961). Modern revisions of the different local associations (as we have from Taman, Tiraspol, and Binagady) are necessary for detailed subdivisions and correlations.

## Carnivora

*Canis lupus* Linnaeus*Vulpes vulpes* (Linnaeus)*Vulpes corsac* (Linnaeus)*Panthera leo spelaea* (Goldfuss)*Crocuta crocuta spelaea* (Goldfuss)*Ursus arctos* Linnaeus

## Proboscidea

*Mammonteus trogontherii* (Pohlig) progressive type*Mammonteus primigenius* (Blumenbach) primitive type*Palaeoloxodon antiquus* (Falconer)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)*Coelodonta antiquitatis* (Blumenbach)*Elasmotherium sibiricum* Fischer von Waldheim*Equus chorsaricus* Gromov*Equus missi* Pavlova

## Artiodactyla

*Sus scrofa* Linnaeus*Megaloceros giganteus* ssp.*Cervus elaphus* Linnaeus*Alces alces* (Linnaeus)*Rangifer tarandus* (Linnaeus)*Capreolus capreolus* (Linnaeus)*Camelus knoblochi* Nehring*Saiga tatarica* Linnaeus*Bison priscus longicornis* Gromov

73. Syngyl faunal complex (Southern Zavolzhie, lower Volga River), USSR (Gromov, Alexeev, Vangengeim, Kind, Nikiforova and Ravsky 1965; Nikiforova 1968; Alexeeva 1968)

In the European part of the Soviet Union, fossil associations suggested to be correlated with the Schönebeck-Steinheim (*Palaeoloxodon antiquus* gravels) associations are reported from an area near Raygorod (Volga River). These fossil associations have been discovered in the Syngyl layers succeeding the marine Bakinian (=Baku series). Near Chernojarsk, the Syngyl horizons are overlain by fossiliferous Khazar layers. The faunal complex of Syngyl obviously represents an intermediate stage between the Tiraspol and the Khazar faunal complexes (Nikiforova 1968).

## Proboscidea

*Palaeoloxodon antiquus* (Falconer)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)? *Elasmotherium sibiricum* Fischer von Waldheim

## Artiodactyla

*Bos volgensis* (Gromov)

#### IV. UPPERMOST MIDDLE PLEISTOCENE AND LOWER UPPER PLEISTOCENE

##### A. Western Province (Selected Macrofaunas)

74. Cueva de Castillo I and II (Santander), Spain  
(Carballo 1910; Obermaier 1925, 1934; Breuil and Obermaier 1935; González Echegaray 1951, 1962; Crusafont-Pairó 1960; Altuna 1971)  
Lower horizon  
Carnivora  
*Ursus spelaeus* Rosenmüller and Heinroth  
Artiodactyla  
*Rangifer tarandus* (Linnaeus)  
Middle horizon  
Carnivora  
*Canis lupus* Linnaeus  
*Panthera leo spelaea* (Goldfuss)  
*Crocota crocuta spelaea* (Goldfuss)  
*Ursus spelaeus* Rosenmüller and Heinroth  
Proboscidea  
*Palaeoloxodon antiquus* (Falconer)  
Perissodactyla  
*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* sp.  
Artiodactyla  
*Sus scrofa* Linnaeus  
*Cervus elaphus* Linnaeus  
*Rupicapra rupicapra* (Linnaeus)  
*Bos primigenius* Bojanus  
*Bison priscus* (Bojanus)
75. Cueva de Morin I (Villanueva, Villaescusa), Spain  
(Vega del Sella 1921; Carballó 1923; González Echegaray and Freeman 1971; Altuna 1972)  
Perissodactyla  
*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* sp.  
Artiodactyla  
*Cervus elaphus* Linnaeus  
*Bos primigenius* Bojanus

76. Olazagutia Cave (Yacimiento de Coscobilo, Navarra), Spain  
(Ruiz de Goana 1941, 1952, 1958; Maluquer de Motes 1957; Crusafont-Pairó 1960; Barandiarán 1967; Altuna 1972)

##### Carnivora

*Canis lupus* Linnaeus  
*Vulpes vulpes* (Linnaeus)  
*Felis* sp.  
*Panthera pardus* (Linnaeus)  
*Crocota crocuta spelaea* (Goldfuss)  
*Ursus spelaeus* Rosenmüller and Heinroth  
*Ursus arctos* Linnaeus  
*Mustela* sp.

##### Perissodactyla

*Dicerorhinus ?megarhinus* de Christol (= *Dicerorhinus kirchbergensis*)  
*Equus* sp.

##### Artiodactyla

*Hippopotamus antiquus* Desmarest  
*Sus scrofa* Linnaeus  
*Cervus elaphus* Linnaeus  
*Capreolus capreolus* (Linnaeus)  
*Capra* sp.

77. Cueva de Lezetxiki (Garagarza, Mondragón), Spain  
(Altuna 1972)

##### Layer VIII

##### Carnivora

*Panthera leo spelaea* (Goldfuss)  
*Ursus* cf. *deningeri* von Reichenau (= *U. spelaeus*?)

##### Perissodactyla

*Dicerorhinus* sp.

##### Artiodactyla

*Bos primigenius* Bojanus  
*Bison priscus* (Bojanus)

##### Layers V to VII

##### Carnivora

*Canis lupus* Linnaeus  
*Vulpes vulpes* (Linnaeus)  
*Felis (Lynx) lynx* Linnaeus  
*Panthera leo spelaea* (Goldfuss)

*Panthera pardus* (Linnaeus)  
*Ursus spelaeus* Rosenmüller and Heinroth  
*Ursus arctos* Linnaeus

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
 ?*Dicerorhinus hemitoechus* (Falconer)  
*Equus* sp.

## Artiodactyla

*Sus scrofa* Linnaeus  
*Megaloceros giganteus* ssp.  
*Cervus elaphus* Linnaeus  
*Capreolus capreolus* (Linnaeus)  
*Capra* sp.  
*Rupicapra rupicapra* (Linnaeus)  
*Bison priscus* (Bojanus)

78. Fontéchevade (Dordogne), France  
 Alimen, Arambourg and Schreuder 1958; Chaline 1965; Jánossy 1969)

## Carnivora

*Canis lupus* Linnaeus  
*Cuon alpinus* Pallas  
*Vulpes vulpes* (Linnaeus)  
*Vulpes* cf. *lagopus* (Linnaeus)  
*Crocuta crocuta* (Erxleben)  
*Ursus spelaeus* Rosenmüller and Heinroth  
*Martes* sp.  
*Putorius putorius* (Linnaeus)  
*Mustela erminea* Linnaeus  
*Mustela nivalis* Linnaeus  
*Meles meles* (Linnaeus)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* sp.  
*Equus hydruntinus* Regalia

## Artiodactyla

*Sus scrofa* Linnaeus  
*Cervus elaphus* Linnaeus  
*Dama* cf. *grimaldensis* Patte  
*Capreolus capreolus* (Linnaeus)  
 Bovidae gen. et sp. indet.

79. Montereau II (Seine), France  
 (For references, see Montereau I, Number 61)

## Proboscidea

*Palaoloxodon antiquus* (Falconer)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)

## Artiodactyla

*Hippopotamus antiquus* Desmarest

80. Montereau III (Seine), France  
 (For references, see Montereau, Number 61)

## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

81. Grotte du Prince (Ligurie italienne), France  
 (Boule 1910–1919; M. F. Bonifay 1962, 1971; M. F. Bonifay and E. Bonifay 1962; Sickenberg 1965; Jánossy 1965)

## "Foyer D"

## Carnivora

*Canis lupus* Linnaeus  
*Felis (Lynx) lynx* Linnaeus  
*Panthera pardus* (Linnaeus)  
*Crocuta crocuta spelaea* (Goldfuss)  
*Ursus spelaeus* Rosenmüller and Heinroth  
*Ursus arctos* Linnaeus

## Proboscidea

*Palaoloxodon antiquus* (Falconer)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* cf. *stenonis* Cocchi  
*Equus* sp.

## Artiodactyla

*Hippopotamus antiquus* Desmarest  
*Cervus elaphus* Linnaeus  
*Dama grimaldensis* Patte  
*Capreolus capreolus* (Linnaeus)  
*Capra ibex* (Linnaeus)  
 Bovidae gen. et sp. indet.

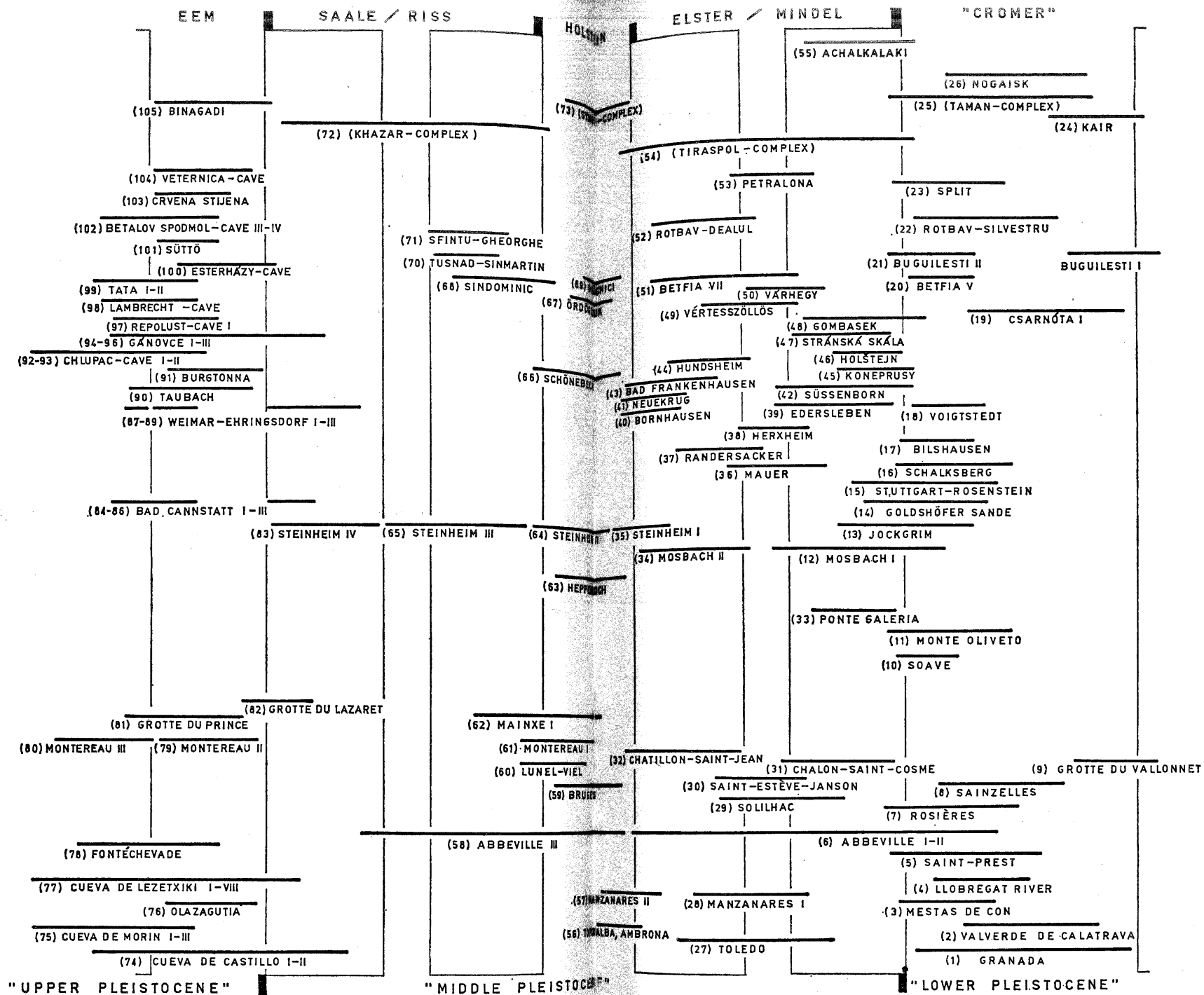


Figure 1. Provisional summary of the sequence of mid-Pleistocene macrofaunas of continental Europe

82. Grotte du Lazaret (Alpes-Maritimes), France  
(Gagnière 1957, 1969; de Lumley 1965; E. Bonifay 1968; M. F. Bonifay 1969, 1971)

## Carnivora

*Canis lupus* Linnaeus  
*Vulpes vulpes* (Linnaeus)  
*Felis (Lynx) spelaea* Boule  
*Felis* sp., cf. *Felis (Lynx) pardina* Temminck  
*Panthera* sp.

## Perissodactyla

*Equus* sp.

## Artiodactyla

*Cervus elaphus* Linnaeus  
*Dama* sp.  
*Rupicapra rupicapra* (Linnaeus)  
*Capra ibex* Linnaeus  
Bovidae gen. et sp. indet.

## B. Transitional Zone, Rhine River Area s. 1.

83. Steinheim IV (Murr), West Germany  
(For references, see Steinheim I, Number 35)  
Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

84. Bad Cannstatt I (Stuttgart), West Germany  
(Frank 1950; Soergel 1929; Berckhemer 1930, 1950; Staesche 1941; Adam 1953)  
"Auemergel and Nagelfluh"

## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)  
*Equus* cf. *germanicus* Nehring

## Artiodactyla

*Megaloceros giganteus germaniae* (Pohlig)

85. Bad Cannstatt II (Stuttgart), West Germany  
(For references, see Bad Cannstatt, Number 84)

## "Main Travertine and Travertine sand"

## Carnivora

*Ursus arctos* Linnaeus

## Proboscidea

*Palaeoloxodon antiquus* (Falconer)

## Perissodactyla

*Dicerorhinus hemitoechus* (Falconer)

*Equus* cf. *germanicus* Nehring

## Artiodactyla

*Sus scrofa* Linnaeus

*Megaloceros giganteus* ssp.

*Cervus elaphus* Linnaeus

*Bos primigenius* Bojanus

86. Bad Cannstatt III (Stuttgart), West Germany  
(For references, see Bad Cannstatt, Number 84)  
Uppermost Travertine and Travertine sand  
Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Equus* cf. *germanicus* Nehring

## Artiodactyla

*Bison* cf. *priscus* (Bojanus)

## C. Eastern Province

87. Weimar-Ehringsdorf I (Weimar), East Germany  
(Wüst 1908, 1909, 1910, 1922; Hahne and Wüst 1908; Soergel 1912, 1917, 1922, 1926, 1927, 1939, 1940; Freudenberg 1914; Wiegers, Weidenreich, and Schuster 1928; Rode 1931, 1935; Stehlin 1933; Stehlin and Graziosi 1935; Schertz 1936, 1937; Zotz 1951; Kahlke 1958)

## Lower Gravels

## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

88. Weimar-Ehringsdorf II (Weimar), East Germany  
(For references, see Weimar-Ehringsdorf I, Number 87)

## Lower Travertine

## Carnivora

- Canis lupus* Linnaeus
- Vulpes vulpes* (Linnaeus)
- Felis (Lynx) lynx* (Linnaeus)
- Panthera leo spelaea* (Goldfuss)
- Ursus* cf. *spelaeus* Rosenmüller and Heinroth
- Martes martes* (Linnaeus)
- Meles meles* (Linnaeus)

## Proboscidea

- Palaeoloxodon antiquus* (Falconer)

## Perissodactyla

- Dicerorhinus kirchbergensis* (Jäger)
- Dicerorhinus hemitoechus* (Falconer)
- Equus* cf. *germanicus* Nehring

## Artiodactyla

- Sus scrofa* Linnaeus
- Megaloceros giganteus germaniae* (Pohlig)
- Cervus elaphus* Linnaeus
- Alces latifrons postremus* Vangengeim and Flerov
- Capreolus capreolus* (Linnaeus)
- Bison priscus* (Bojanus)

89. Weimar-Ehringsdorf III (Weimar), East Germany  
(For references, see Weimar-Ehringsdorf I, Number 87)  
"Upper Travertine I and II (including "Pariser" and "Pseudo-pariser")

## Carnivora

- Crocuta crocuta spelaea* (Goldfuss)
- Ursus* cf. *spelaeus* Rosenmüller and Heinroth
- Putorius evermanni* (Lesson)
- Martes martes* (Linnaeus)
- Lutra lutra* (Linnaeus)

## Proboscidea

- Mammonteus primigenius* (Blumenbach)

## Perissodactyla

- Coelodonta antiquitatis* (Blumenbach)
- Dicerorhinus hemitoechus* (Falconer)
- Equus* cf. *germanicus* Nehring
- Equus hydruntinus* Regalia

## Artiodactyla

- Bison priscus* (Bojanus)
- Megaloceros giganteus germaniae* (Pohlig)
- Cervus elaphus* Linnaeus
- Rangifer tarandus* (Linnaeus)
- Capreolus capreolus* (Linnaeus)

90. Taubach (Weimar), East Germany  
(Meyer 1857, 1859; Portis 1878; Pohlig 1889, 1892; Wüst 1908, 1909, 1911, 1922; Hahne and Wüst 1908; Soergel 1911, 1912, 1922, 1926; Freudenberg 1914; von Reichenau 1915; Wiegers, Weidenreich, and Schuster 1928; Schroeder 1930; Rode 1931, 1935; Schmid 1940, 1949; Kahlke 1958, 1961)

## "Lower Travertine"

## Carnivora

- Canis lupus* Linnaeus
- Felis (Lynx) lynx* Linnaeus
- Panthera leo spelaea* (Goldfuss)
- Panthera pardus* (Linnaeus)
- Crocuta crocuta spelaea* (Goldfuss)
- Ursus arctos taubachensis* Rode

## Proboscidea

- Palaeoloxodon antiquus* (Falconer)

## Perissodactyla

- Dicerorhinus kirchbergensis* (Jäger)
- Equus germanicus taubachensis* Freudenberg

## Artiodactyla

- Sus scrofa* Linnaeus
- Megaloceros giganteus germaniae* (Pohlig)
- Cervus elaphus* Linnaeus
- Dama dama* (Linnaeus)
- Alces latifrons postremus* Vangenheim and Flerov
- Capreolus capreolus* (Linnaeus)
- Bison priscus* (Bojanus)

In materials excavated from Taubach before 1900, a series of *Mammonteus primigenius* molars was found showing a typical travertine fossilization. It seems possible that these molars were excavated by quarrymen from the uppermost travertine layers of Taubach (*plattiger* travertine). In this case, we see, in the uppermost layers of Taubach, equivalents of the upper travertine of Weimar-Ehringsdorf and the uppermost

travertine of Bad Cannstatt, corresponding to an earliest Weichsel (= earliest Würm) stage.

91. Burgtonna (Gotha), East Germany  
(Collegium Medicum Gothanum 1696, 1697; Tentzel 1696, 1697; Florschütz 1905; Schäfer 1909; Schroeter 1930; Dietrich 1968)

Carnivora

*Vulpes vulpes* (Linnaeus)  
*Panthera leo spelaea* (Goldfuss)  
*Crocuta crocuta spelaea* (Goldfuss)  
*Ursus arctos* Linnaeus

Proboscidea

*Palaeoloxodon antiquus* (Falconer)

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* cf. *germanicus* Nehring

Artiodactyla

*Sus scrofa* Linnaeus  
*Megaloceros giganteus* ssp.  
*Cervus elaphus* Linnaeus  
*Dama* sp.  
*Capreolus capreolus* (Linnaeus)  
*Bison priscus* (Bojanus)

92. Chlupac cave I (Coneprusy), Czechoslovakia  
(Schubert 1900, Petbrok 1953, 1954; Zazvorka 1954; Mostecký 1961, 1963, 1964, 1966, 1969)

Carnivora

*Vulpes* sp.  
*Panthera leo spelaea* (Goldfuss)  
*Crocuta crocuta spelaea* (Goldfuss)  
*Ursus arctos taubachensis* Rode  
*Meles meles* (Linnaeus)

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* sp.

Artiodactyla

*Sus scrofa* Linnaeus  
*Cervus elaphus* Linnaeus  
*Dama dama* (Linnaeus)  
*Capreolus capreolus* (Linnaeus)  
*Bison priscus* (Bojanus)

93. Chlupac cave II (Coneprusy), Czechoslovakia  
(For references, see Chlupac cave, Number 92)

Carnivora

*Canis lupus* Linnaeus  
*Vulpes vulpes* (Linnaeus)  
*Vulpes* sp.

Perissodactyla

*Equus* cf. *mosbachensis* von Reichenau  
*Equus germanicus* Nehring

Artiodactyla

*Rangifer* sp.  
*Rupicapra rupicapra* (Linnaeus)  
*Bison priscus* (Bojanus)

94. Gánovce I (Proprad, Slovakia), Czechoslovakia  
(Staub 1893; Vlček 1950, 1953; Jánossy 1969)  
"Lower layers (sand and clays)"

Proboscidea

*Mammonteus primigenius* (Blumenbach)

Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

Artiodactyla

*Rangifer tarandus* (Linnaeus)

95. Gánovce II (Poprad, Slovakia), Czechoslovakia  
(For references, see Gánovce I, Number 94)  
"Travertine"

Proboscidea

*Palaeoloxodon antiquus* (Falconer)

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)  
*Equus* sp.

Artiodactyla

*Sus scrofa* Linnaeus  
*Cervus elaphus* Linnaeus

96. Gánovce III (Poprad, Slovakia), Czechoslovakia  
(For references, see Gánovce I, Number 94)  
"Upper layers"

Carnivora

*Canis lupus* Linnaeus



## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)*Equus* sp.*Equus hydruntinus* Regalia

## Artiodactyla

*Rangifer tarandus* (Linnaeus)

97. Repolust cave I (Peggau), Austria  
(Mottl 1951, 1955, 1960, 1967)

"Rostbraune Schicht"

## Carnivora

*Canis lupus* Linnaeus*Canis* sp.*Cuon alpinus* ssp.*Vulpes vulpes* (Linnaeus)*Vulpes vulpes* ssp.*Felis silvestris* Schreber*Panthera leo spelaea* (Goldfuss)*Panthera pardus* (Linnaeus)*Ursus arctos* Linnaeus*Ursus spelaeus* Rosenmüller and Heinroth*Martes martes* (Linnaeus)*Putorius putorius* (Linnaeus)*Meles meles* (Linnaeus)

## Proboscidea

Elephantidae gen. et sp. indet.

## Artiodactyla

*Sus scrofa* Linnaeus*Megaloceros giganteus* ssp.*Cervus elaphus* Linnaeus*Rangifer tarandus* (Linnaeus)*Capreolus capreolus* (Linnaeus)*Rupicapra rupicapra* (Linnaeus)*Capra ibex* Linnaeus*Bison priscus* (Bojanus)

98. Kálmán Lambrecht Cave (Bükk Mountains), Hungary  
(Jánosy 1953, 1963, 1964; Mottl, 1967)

## Carnivora

*Canis lupus* Linnaeus*Vulpes vulpes* (Linnaeus)*Felis silvestris* Schreber*Panthera leo spelaea* (Goldfuss)*Panthera pardus* (Linnaeus)*Crocuta crocuta spelaea* (Goldfuss)*Ursus arctos* Linnaeus*Ursus spelaeus* Rosenmüller and Heinroth*Mustela nivalis* Linnaeus*Putorius putorius* (Linnaeus)*Martes martes* (Linnaeus)*Meles meles* (Linnaeus)

## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)*Equus* sp.*Equus hydruntinus* Regalia

## Artiodactyla

*Sus scrofa* Linnaeus*Megaloceros giganteus* ssp.*Cervus elaphus* Linnaeus*Alces alces* (Linnaeus)*Rangifer tarandus* (Linnaeus)*Capreolus capreolus* (Linnaeus)*Ovis* sp.*Bison priscus* (Bojanus)

99. Tata I (Tata), Hungary  
(Townson 1973; Kiss 1818; Kormos 1912; Kretzoi 1964)

## Carnivora

*Canis lupus spelaeus* Goldfuss*Crocuta crocuta spelaea* (Goldfuss)*Ursus arctos* Linnaeus*Ursus spelaeus* Rosenmüller and Heinroth*Putorius* sp.*Mustela* sp.*Meles meles* (Linnaeus)

## Proboscidea

*Mammonteus primigenius* (Blumenbach)

## Perissodactyla

? *Dicerorhinus kirchbergensis* (Jäger)*Coelodonta antiquitatis* (Blumenbach)

*Equus* sp. (cf. *steinheimensis* von Reichenau)

*Equus hydruntinus* Regalia

Artiodactyla

*Sus scrofa* Linnaeus

*Megaloceros giganteus* ssp.

*Bos* or *Bison* sp.

100. Esterházy Cave (Csákvár, Hungary  
(Kadic and Kretzoi 1930; Kretzoi 1952; Jánossy 1969)

Carnivora

*Crocuta crocuta* (Erxleben)

*Ursus* cf. *arctos* Linnaeus

Perissodactyla

*Coelodonta antiquitatis* (Blumenbach)

*Equus* cf. *steinheimensis* von Reichenau

*Equus hydruntinus* Regalia

Artiodactyla

*Sus scrofa* Linnaeus

*Megaloceros giganteus* ssp.

*Cervus elaphus* Linnaeus

*Dama* cf. *somomensis* (Desmarest)

101. Süttő (Transdanubia), Hungary  
(Kormos 1925; Kretzoi 1938, 1953; Jánossy 1969)

Carnivora

*Canis lupus* Linnaeus

*Vulpes vulpes* (Linnaeus)

*Panthera leo* ssp.

?*Crocuta* sp.

Perissodactyla

*Equus* sp.

Artiodactyla

*Sus scrofa* Linnaeus

*Cervus elaphus* Linnaeus

*Dama* sp.

*Capreolus capreolus* (Linnaeus)

Bovidae gen. et sp. indet.

102. Betalov Spodmol Cave III-IV (Postojna), Yugoslavia  
(Anelli 1933; Brodar 1947, 1948, 1949, 1950, 1952, 1954, 1956;  
Rakovec 1952, 1955, 1959; Dietrich 1957)

Carnivora

*Canis lupus* Linnaeus

*Vulpes vulpes* (Linnaeus)

*Crocuta crocuta spelaea* (Goldfuss)

*Ursus spelaeus* Rosenmüller and Heinroth

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)

Artiodactyla

*Sus scrofa* Linnaeus

*Megaloceros giganteus* ssp.

*Cervus elaphus* Linnaeus

*Alces alces* (Linnaeus)

103. Crvena Stijena XXVIII-XXIX (Bileća), Yugoslavia  
(Benac and Brodar 1957, 1958; Rakovec 1958; Brodar 1959;  
Malez 1962, 1965, 1966; Basler and Malez 1966)

Carnivora

*Ursus arctos* Linnaeus

Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)

*Equus germanicus* Nehring

Artiodactyla

*Sus* sp.

*Megaloceros giganteus* ssp.

*Cervus elaphus* Linnaeus

*Dama* sp.

*Capreolus capreolus* (Linnaeus)

*Capra* sp.

*Ovis* sp.

Bovidae gen. et sp. indet.

104. Veternica cave (Zagreb), Yugoslavia  
(Malez 1963; Mottl 1967)

Carnivora

*Canis lupus* Linnaeus

*Canis* sp.

*Cuon alpinus europaeus* Bourguignat

*Vulpes vulpes* (Linnaeus)

*Vulpes* cf. *lagopus* (Linnaeus)

*Felis silvestris* Schreber

*Felis (Lynx) pardina* Temminck

*Panthera leo spelaea* (Goldfuss)

*Panthera pardus* (Linnaeus)  
*Crocuta crocuta spelaea* (Goldfuss)  
*Ursus arctos* Linnaeus  
*Ursus spelaeus* Rosenmüller and Heinroth  
*Mustela erminea* Linnaeus  
*Putorius putorius* (Linnaeus)  
*Martes martes* (Linnaeus)  
*Martes foina* (Erxleben)  
*Gulo gulo* (Linnaeus)  
*Meles meles* (Linnaeus)

## Perissodactyla

*Dicerorhinus kirchbergensis* (Jäger)

## Artiodactyla

*Sus scrofa* Linnaeus  
*Megaloceros giganteus* ssp.  
*Cervus elaphus* Linnaeus  
*Dama* cf. *dama* (Linnaeus)  
 Cervidae gen. et sp. indet.  
*Alces alces* (Linnaeus)  
*Capreolus capreolus* (Linnaeus)  
*Rupicapra rupicapra* (Linnaeus)  
*Capra ibex* Linnaeus  
*Capra* sp.  
*Ovis* sp.  
*Bos primigenius* Bojanus  
 Bovidae gen. et sp. indet.

105. Binagadi (Caspian Sea), USSR  
 (Burshak-Abramowitsch and Dzhafarov 1951, 1953, 1955;  
 Veresčagin 1947, 1951, 1953, 1959; Alekperova 1952, 1959;  
 Burshak-Abramowitsch 1953; Dzhafarov 1955)

## Carnivora

*Canis lupus apscheronicus* Veresčagin  
*Canis* sp.  
*Vulpes vulpes* aff. *alpherakyi* Satunin  
*Vulpes corsac* (Linnaeus)  
*Felis* sp.  
*Panthera leo spelaea* (Goldfuss)  
*Acinonyx jubatus* Schreber  
*Crocuta crocuta spelaea* (Goldfuss)  
*Ursus arctos binagadensis* Veresčagin

*Vormela peregusna* Guldenstaedt

*Meles meles minor* Satunin

## Perissodactyla

*Dicerorhinus binagadensis* Dzhafarov

*Equus* sp.

*Equus* cf. *hydruntinus* Regalia

## Artiodactyla

*Sus apscheronicus* Burschak-Abramowitsch and Dzhafarov

*Megaloceros giganteus* ssp.

*Cervus elaphus binagadensis* Alekperova

*Saiga tatarica binagadensis* Alekperova

*Ovis* cf. *ammon* Linnaeus

*Bos mastan-zadei* Burschak-Abramowitsch

## PROBLEMS OF INTERCORRELATION WITH CONTINENTAL ASIA AND THE FAR EAST

In trying to correlate "Middle Pleistocene" fossil macrofaunas of Europe and continental Asia, we find a key association in the alluvial deposits of Kolkotova terrace V of the Dniestr River, near Tiraspol, Moldavian Soviet Socialist Republic. These are generally known as the Tiraspol Gravels. The fossil association of this locality in general is considered to be contemporaneous with the main fauna of Süssenborn, East Germany. In both horizons we find almost identical species aside from, in Tiraspol, *Dicerorhinus etruscus* (Falconer) and the younger *Dicerorhinus kirchbergensis* (Jäger), as well as a progressive type of caballine horse (*Equus* aff. *mosbachensis* von Reichenau). On the other hand, the Tiraspol elephant, *Mammonteus trogontherii* (Pohlig) (= *Elephas wüsti* Pavlova), is less advanced than the Süssenborn elephant, but this may reflect ecological differentiations between southern and northern populations of the *Mammonteus trogontherii-primigenius* evolution line. On the basis of this analysis, the Tiraspol faunal complex seems to correlate with the central European fossil localities of Süssenborn (Elster/Mindel I) and Mosbach (Elster/Mindel I and II).

Further to the East, in western and eastern Siberia, there are only some fifteen fossil localities showing "Süssenborn-Tiraspol affinities" (Alekseev 1970; Vangengeim and Sher 1970), and these are irregularly distributed throughout this vast area. Most of these localities have only one or a few species — if they have any specimens at all. Two exceptions, however, are to be mentioned: the type-locality of the Tologoy faunal

complex (Vangengeim and Ravsky 1965; Vangengeim, et al. 1966), Tologoy Mountains (Ulan-Ude), and the type-association of the Olyor faunal complex, the Olyor suite deposits at Chukotija River, Kolyma Lowlands (Sher 1971). As has been demonstrated by Vangengeim and Sher (1970) we may distinguish, within the limits of Siberia, four paleozoogeographical subregions: western Siberia showing "European elements" (*Praemegaceros verticornis* and *Equus* aff. *mosbachensis*), eastern Siberia, the extreme Northeast, and Transbaikalia with central Asiatic endemics. A correlation of these faunas belonging to different paleogeographical regions is difficult and possible only within wide stage boundaries (see Figure 1, between pp. 352-353).

According to our present knowledge, we may refer all Siberian fossil associations of "Süssenborn-Tiraspol affinities" to the "Elster/Mindel" s. 1, in order to characterize preliminarily their tentative position in the geochronological sequence. In Kazakhstan, the Koshkurgan faunal complex (Bashanov and Kostenki 1961; Bashanov 1962; Khisarova 1963; Kojamkulova 1969) seems to be correlated to the central European-East European Süssenborn-Tiraspol faunal complex suggesting a second line of land mammal correlations from Europe to the Far East.

Today, by means of land mammal associations, we may distinguish three correlation lines. These link continental Europe with:

- continental Asia, Bering land bridge, and Alaska,
- continental Asia, Transbaikalia, the Far East (Southeast Asia and India), and
- Ponto-Caspian region, Kazakhstan, Dzungaria (Northwest China).

The first correlation line runs from continental Europe through West Siberia, East Siberia, extreme Northeast Asia, and via the Bering land bridge to Alaska. This first correlation line of "Middle Pleistocene" mammalian associations, beginning with the continental European "Süssenborn-Tiraspol faunal complex," can be extended by means of the West and East Siberian Middle Pleistocene fossil localities at Tobolsk (Ishim-Irtish) region (Tobolsk suite) (Volkova 1966; Vangengeim and Sher 1970), by the fossil locality at the Yenisey River Basin, near the Bachtá River mouth (Vangengeim 1961; Vangengeim and Sher 1970) via the Olyominsk (Vangengeim 1960) and localities at the mouth of the Chebede River (Alexseev 1961; 1970) to the extreme Northeast (Indigirka-Kolyma River region) localities of the Bereliach River (Vangengeim 1961) and Olyor suite (Chukochija River) (Sher 1969; 1971). Typical members of these Middle Pleistocene Siberian fossil sites are *Mammonteus trogontherii* (Pohlig) (= *Elephas wüsti* Pavlova), *Dicerorhinus kirchbergensis*, *Dicerorhinus hemitoechus*, *Dicerorhinus binag-*

*adensis* group s. 1.; *Equus stenonis*, *Equus süssenbornensis*, *Equus verae* group s. 1.; *Alces latifrons* (Johnson), *Praeovibos*, and *Soergelia*.

The second correlation line extends from continental Europe through West Siberia, East Siberia, and Transbaikalia, to the Far East (South-east Asia and India). This second line of Middle Pleistocene mammalian associations begins with the continental European Süssenborn-Tiraspol faunal complex and can be extended through the fossil sites of the upper Irtish River area fossil localities of Krasnokutskoje (Vangengeim and Zazhigin 1965; Vangengeim and Sher 1970), the upper Ob River region Kochkov suite (subaerial loams), via the Angara River "Middle Pleistocene" sites (Vangengeim and Sher, 1970) to the Tologoy faunal complex (Ravsky et al. 1964; Vangengeim and Ravsky 1965). The sites at Tologoy (upper part of the middle member of the Tologoy Mountain section not far from Ulan Ude) and Dodogol (Vangengeim and Sher 1970) link the Soviet Union Transbaikalian sites with those of Inner Mongolia, the Province of Hopei, China, and especially, the classical "Middle Pleistocene" (post-Villafranchian, Lower Sanmenian of local stratigraphy) locality of Nihowan (Teilhard de Chardin and Piveteau 1930). Typical members of this southern correlation line are hyenas of the *Crocota* group, an early *Mammonteus* sp., *Palaeoloxodon* of the *namadicus* group, the *Equus sanmeniensis* group, *Coelodonta tologoiensis* Beliajeva (Tologoy and Nihowan), primitive *Bison* and *Spiroceros* cf. *peii* Young, and species which are present in general in both faunistic associations at Tologoy and Nihowan.

The third correlation line extends from continental Europe through the Ponto-Caspian region and Kazakhstan to Dzungaria, Northwest China. The third European-Asiatic correlation line makes it possible to correlate the Tiraspol faunal complex with the Kazakhian-Koshkurgan faunal complex of which some twenty localities are known today. The main areas of distribution are Central Kazakhstan, Southern Altai, and the Tien-shan areas (Kojamkulova 1969). The line leads from the upper Irtish River sites of Chernojarka, Krasnojarka, Maraldy, Podpusk, and Ostraja Sopka (Kojamkulova 1969) to the northern Sinkiang fossil locality of Ulanbulan (Dzungaria Basin), China (Chow 1957; Kahlke 1968).

#### PROBLEMS OF INTERCORRELATION WITH THE MIDDLE EAST

To link the Central European-East European "Lower Middle Pleistocene"

Süssenborn-Tiraspol faunal complex with the faunal sequence of the Middle East we can make use of a key association in the "Middle Pleistocene" (Mindel) gravels of the Orontes Valley at Latamme, Syria (Hooijer 1962). At this site we find *Mammonteus trogontherii* (Pohlig) associated with *Praemegaceros verticornis* (Dawkins), a first-class correlation species with a distribution (only "Cromer" and Mindel) extending from southern Spain (Granada) (Kahlke 1969) to as far as Achalkalaki, Transcaucasia (Vekua 1962) and Latamme, Orontes Valley, Syria (Hooijer 1962). The fossil association of Jisr Banat Yaqub, Israel (Hooijer 1960) is closely related to this horizon, which is perhaps late Mindel or early Mindel-Riss of the Alpine sequence. Following this correlation line to the south we find the fossil association of 'Ubeidiya in Israel (Haas 1966), a typical early Middle Pleistocene, not Lower Pleistocene (Villafranchian), association as has already been noticed by D. A. Hooijer (1968).

#### SELECTED REFERENCES<sup>1</sup>

- ADAM, K. D.  
 1952 Die altpleistozänen Säugetierfaunen Südwestdeutschlands. *Neues Jahrbuch für Geologie und Paläontologie*, Monatshefte 5:229-236. Stuttgart.  
 1953 Säugetierfunde im württembergischen Pleistozän. 1-10 (verbreitet anlässlich der 5. Hauptversammlung der Deutschen Quartärvereinigung in Stuttgart, Maschinenschrift).  
 1954 Die mittelpleistozänen Faunen von Steinheim an der Murr. *Quaternaria* (Storia naturale e culturale del Quaternario) 1:131-144. Rome.  
 1958 *Dicerorhinus kirchbergensis* (Jäger) aus einer Karsthöhle bei Črni Kal (Istrien, Jugoslawien). *Academia Scientiarum et Artium Slovenica, Classis IV: Historia Naturalis, Dissertationes* 4:437-440. Ljubljana.  
 1959 Mittelpleistozäne Caniden aus dem Heppenloch bei Gutenberg (Württemberg). *Stuttgarter Beiträge zur Naturkunde* 27:1-46. Stuttgart.
- AGUADO, M. M.  
 1962 El hombre primitivo en Toledo. *Toletum* 3:175-206. Toledo.  
 1963 *El yacimiento prehistorico de Pinedo (Toledo) y su industria triedrica*. Publicaciones del Instituto Provincial de Investigaciones y Estudios Toledanos, second series, 1:1-70. Toledo.  
 1968 Versuch eines chrono-stratigraphischen Vergleichs des Unteren und Mittleren Pleistozäns beiderseits des Tajo. *Berichte der Deut-*

*schen Gesellschaft für geologische Wissenschaften, Reihe A: Geologie und Paläontologie* 13(3):289-298. Berlin.

- AGUIRRE, E.  
 1965 Los elefants de las terrazas medias de Toledo y la edad de estos depositos. *Cátedra de Paleontologia, Facultad de Ciencias, Madrid* 4:1-2. Zaragoza.
- ALEKSEEV, M. N.  
 1961 Stratigraphy of continental Neogene and Pleistocene deposits in the Vilyuy Basin and the Lena downstream valley. *Trudy geologičeskogo Instituta, Akademia Nauk SSSR* 51:1-118. Moscow (in Russian).  
 1970 An occurrence of Tiraspolian fauna at the Vilyuy river (Eastern Siberia). *Palaeogeography, Palaeoclimatology, Palaeoecology* 8:209-214. Amsterdam.
- ALEXANDROVA, L. P.  
 1965 Rodentia of Chazar-deposits of the lower Pavolsha (Černij Jar). *Publication VII. INQUA-Congress, 1965. Akademia Nauk SSSR* 149-157. Moscow (in Russian).
- ALEXEEVA, L. I.  
 1968 Die asiatischen Elemente in der Säugetierfauna des osteuropäischen Anthropogens. *Berichte der deutschen Gesellschaft für geologische Wissenschaften, Reihe A: Geologie und Paläontologie* 13(3):299-303. Berlin.  
 1969 The habitat of faunal assemblages of the Anthropogene of Eastern Europe. *Résumés des Communications, VIIIe Congres INQUA*:117. Paris.
- ALTUNA, J.  
 1971 Fauna de mamíferos de los yacimientos prehistoricos de Guipuzcoa. *Munibe* 24(1-4):1-464. San Sebastian.
- AMBROSETTI, P., A. AZZAROLI, F. P. BONADONNA, M. FOLLIERI  
 1972 A scheme of Pleistocene chronology for the Tyrrhenian side of central Italy. *Bolletino della Società Geologica Italiana* 91:169-184. Rome.
- AZZAROLI, A., P. AMBROSETTI  
 1970 Late Villafranchian and early mid-Pleistocene faunas in Italy. *Palaeogeography, Palaeoclimatology, Palaeoecology* 8:107-111. Amsterdam.
- BASHANOV, V. S., N. N. KOSTENKO  
 1962 Atlas of the Anthropogene mammals of Kazakhstan: 1-110. Alma-Ata (in Russian).
- BASLER, D., M. MALEZ  
 1966 Die Rote Höhle (Crvena Stijena) bei Bileća/Jugoslawien. *Eiszeitalter und Gegenwart* 17:61-68. Öhringen.
- BIBERSON, P.  
 1964 Torralba et Ambrona: Notes sur deux stations acheuléennes de chasseurs d'éléphants de la Vieille Castille. *Instituto de Prehistoria y Arqueologia Monografias* 6:201-231. Barcelona.
- BONIFAY, E.  
 1968a Aperçu sur le Quaternaire de Grenoble à Marseille. *Bulletin de*

<sup>1</sup> Papers not cited are included in more recent publications given here.

- l'Association française pour l'étude du Quaternaire 1:3-18. Paris.
- 1968b Stratigraphie et industries lithiques de la grotte n° 1 du Mas des Caves à Lunel-Viel (Hérault). *La Préhistoire* (1968):37-46. Paris.
- 1969 Grottes et Abris préhistoriques dans le Sud-Est de la France. *Etudes françaises sur le Quaternaire VIIIe Congrès INQUA*, Paris 1969):81-83. Paris.
- BONIFAY, M. F.
- 1962 Sur la valeur spécifique de l'*Ursus praeartos* M. Boule de la Grotte du Prince (Ligurie italienne). *Bulletin du Musée d'Anthropologie préhistorique de Monaco*, Fascicule 9:65-72. Monaco.
- 1969a Faunes quaternaires de France. *Etude française sur le Quaternaire, VIIIe Congrès INQUA*, Paris, 1969: 127-142. Paris.
- 1969b Principales formes caractéristiques du Quaternaire moyen du Sud-Est de la France (grand mammifères). *Bulletin du Musée d'Anthropologie préhistorique de Monaco* 14:49-62. Monaco.
- 1971 Carnivores quaternaires du Sud-Est de la France. *Mémoires du Musée Nationale d'Histoire Naturelle*, series C, 21(2):43-377. Paris.
- BONIFAY, M. F., E. BONIFAY
- 1962 Sur l'existence de dépôts quaternaires pré-würmiens dans la Grotte du Prince (Ligurie italienne). *L'Anthropologie* 66(1-2):90-99. Paris.
- 1963 Un gisement à faune épi-villafranchienne à Saint-Estève-Janson (Bouches-du-Rhône). *Comptes Rendus de l'Académie des Sciences, Paris* 256; 1136-1138. Paris.
- 1965 Age du gisement de mammifères fossiles de Lunel-Viel (Hérault). *Comptes Rendus de l'Académie des Sciences, Paris* 260:3441-3444. Paris.
- BOURDIER, F., H. LACASSAGNE
- 1963 Précisions nouvelles sur la stratigraphie et la faune du gisement villafranchien de Saint Prest (Eure-et-Loire). *Bulletin de la Société Géologique de France*, seventh series, 5(4):407-650. Paris.
- BOUT, P.
- 1960 *Le Villafranchien du Velay et du Bassin hydrogéographique moyen et supérieur de l'Allier*. Le Puy.
- CHOW, M. M.
- 1957 Notes on some mammalian fossils from the Late Cenozoic of Sinkiang. *Vertebrata Palasiatica* 1(1):33-41. Peking.
- COMMENT, V.
- 1910 Les gisements paléolithiques d'Abbeville. Excursion de la Société Géologique du Nord et de la Faculté des Sciences de Lille, à Abbeville le 11. Juin:249-291. Lille.
- CRUSAFONT-PAIRO, M.
- 1960 Le Quaternaire espagnol et sa faune de mammifères. Essai de synthèse. *Mammalia pleistocaenica, Anthropos Supplement* 1:55-64. Brno.
- 1965 Zur Obergrenze des Villafranchiums in Spanien. *Berichte der geologischen Gesellschaft in der DDR* 10(1):19-48. Berlin.
- The Macrofaunas of Continental Europe*
- DSHAFAROV, R. D., editor
- 1951- Binagady localities of Quaternary fauna and flora, volume one 1955 (1951); volume two (1952); volume three (1953); volume four (1955). Akademia Nauk Azerbaidshanskaja SSSR. Baku (in Russian).
- DUBROVO, I. A.
- 1957 On *Parelephas wüsti* (Pavl.) and *Rhinoceros mercki* Jäger remains from Yakutia. *Byulletin Komissii izsuscheniju Chetvertičnogo Perioda* 21:94-104. Moscow (in Russian).
- 1969 The Anthropogene proboscideans of the USSR. *Résumés des Communications, VIIIe Congrès INQUA*: 122. Paris.
- FEJFAR, C.
- 1961 "Review of Quaternary Vertebrata in Czechoslovakia," in *Czwarťorzęd Europy środkowej i wschodniej*. Instytut Geologiczny, Tome 34, (VI. INQUA-Kongres): 109-118. Warsaw.
- FREUDENBERG, W.
- 1914 *Die Säugetiere des älteren Quartärs von Mitteleuropa mit besonderer Berücksichtigung der Fauna von Hundsheim und Deutschaltenburg in Niederösterreich*. Jena: Fischer.
- GROMOV, V. I.
- 1948 Palaeontological and archaeological evidence on the stratigraphy of continental Quaternary deposits on the territory of the USSR. *Trudy geologičeskogo Instituta, Akademia Nauk SSSR* 64, Geology Series, 17:1-521. Moscow (in Russian).
- GROMOV, V. I., K. V. NIKIFOROVA
- 1965 Über die Grenze zwischen dem Unter- und dem Mittelpleistozän. *Berichte der geologischen Gesellschaft in der DDR* 10(1):13-18. Berlin.
- GROMOV, V. I., K. V. NIKIFOROVA, E. V. SCHANZER, editors
- 1961 Problems of the Anthropogene Geology. *Akademia Nauk SSSR, Geologičeski Institut*, 1-224. Moscow (in Russian, English summary).
- GUENTHER, E. W.
- 1968 Elefantenzähne aus den Mosbacher Sanden, Teil I. *Mainzer Naturwissenschaftliches Archiv* 7:55-73; Teil II, *Mainzer Naturwissenschaftliches Archiv* 8:77-89. Mainz.
- HAAS, G.
- 1966 On the vertebrate fauna of the Lower Pleistocene site 'Ubeidiya. *Israel Academy of Sciences and Humanities*: 1-68. Jerusalem.
- HEMMER, H.
- 1971 Zur Kenntnis pleistozäner mitteleuropäischer Leoparden. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* 138(1): 15-36. Stuttgart.
- 1971 Zur Charakterisierung und stratigraphischen Bedeutung von *Panthera gombaszoegensis* (Kretzoi, 1938). *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 12:701-711. Stuttgart.
- 1972 Zur systematischen Stellung von "*Jansofelis vaufreyi*" Bonifay, 1971, und "*Felis lunellensis*" Bonifay, 1971, aus dem Pleistozän Südfrankreichs (Carnivora, Felidae). *Neues Jahrbuch für Geologie*

- und Paläontologie, Monatshefte 4:215–223. Stuttgart.
- HEMMER, H., G. SCHÜTT  
1969 Ein Unterkiefer von *Panthera gombaszoegensis* (Kretzoi, 1938) aus den Mosbacher Sanden. *Mainzer Naturwissenschaftliches Archiv* 8:90–101. Mainz.
- HOOIJER, D. A.  
1962 Middle Pleistocene mammals from Latamne, Orontes Valley, Syria. *Annales archéologiques de Syrie* 11:117–132. Damascus.  
1968 "The Middle Pleistocene fauna of the Near East," in *Evolution and hominisation*. Edited by G. Kurth, 82–85. Stuttgart: Fischer.
- JÁNOSSY, D.  
1963a Letztinterglaziale Vertebraten Fauna aus der Kálmán Lambrecht-Höhle (Bükk-Gebirge, Nordost-Ungarn) I. *Acta Zoologica Academiae Scientiarum Hungaricae*, 9(3–4):293–331; II, *Acta Zoologica Academiae Scientiarum Hungaricae* 10(1–2):139–195 (1964). Budapest.  
1963b Die altpleistozäne Wirbeltierfauna von Köresvárad bei Répáshuta (Bükk-Gebirge). *Annales Historico-Naturales Musei Nationalis Hungarici, Pars Mineralogica et Palaeontologica* 55:109–141. Budapest.  
1969 Stratigraphische Auswertung der europäischen mittelpleistozänen Wirbeltierfauna, Teil I. *Berichte der deutschen Gesellschaft für geologische Wissenschaften*, Reihe A: *Geologie und Paläontologie* 14(4):367–438; Teil II, *Berichte der deutschen Gesellschaft für geologische Wissenschaften*, Reihe A: *Geologie und Paläontologie* 14(5):573–643. Berlin.
- KAHLKE, H. D.  
1958 Die jungpleistozänen Säugetierfaunen aus dem Travertingebiet von Taubach-Weimar-Ehringsdorf. *Alt-Thüringen* 3:97–130. Weimar.  
1961 Revision der Säugetierfaunen der klassischen deutschen Pleistozän-Fundstellen von Süßenborn, Mosbach und Taubach. *Zeitschrift Geologie*, Jahrgang 10(4–5):493–532. Berlin.  
1965 Zur Grenze Unterpleistozän/Mittelpleistozän. *Berichte der geologischen Gesellschaft in der DDR* 10(1):5–6. Berlin.  
1969 Die Soergelia-Reste aus den Kiesen von Süßenborn bei Weimar. *Paläontologische Abhandlungen*, A, 3(3–4):547–610. Berlin.  
1969 Die Cerviden-Reste aus den Kiesen von Süßenborn bei Weimar. *Paläontologische Abhandlungen*, A, 3(3–4):547–610. Berlin.
- KOJAMKULOVA, B. S.  
1969 The Anthropogene fossils of Kazakhstan. *Akademia Nauk Kazakhstanskaja SSR*: 1–149. Alma-Ata (in Russian).
- KRETZOI, M.  
1938 Die Raubtiere von Gombaszög nebst einer Übersicht der Gesamtfauuna. *Annales Musei Nationalis Hungarici, Pars Mineralogica, Geologica et Palaeontologica* 31:88–157. Budapest.  
1941 Weitere Beiträge zur Kenntnis der Fauna von Gombaszög. *Annales Musei Nationalis Hungarici, Pars Mineralogica, Geologica et Palaeontologica* 34:105–139. Budapest.

- 1956 Die altpleistozänen Wirbeltierfaunen des Villányer Gebirges. *Geologica Hungarica, Series Palaeontologica, Fasciculus* 27:1–264. Budapest.
- 1965 Die Nager und Lagomorphen von Voigtstedt in Thüringen und ihre chronologische Aussage. *Paläontologische Abhandlungen*, A, 2(2–3):584–660. Berlin.
- KURTÉN, B.  
1960 Chronology and faunal evolution of the earlier European glaciations. *Societas Scientiarum Fennica, Commentationes Biologicae* 21(5):1–62. Helsingfors.  
1965 Die untere Grenze des Mittleren Pleistozäns. *Berichte der geologischen Gesellschaft in der DDR* 10(1):7–11. Berlin.
- KUSS, S. E.  
1961 Ein Beitrag zur Pleistocän-Fauna von Herxheim/Pfalz. *Berichte der Naturforschenden Gesellschaft Freiburg im Breisgau* 51(2):145–148. Freiburg.
- MOSTECKÝ, V.  
1969 Jungpleistozäne Säugetiere aus der "Chlupáč-Höhle" auf dem Hügel "Kobyla" bei Koněprusy (Böhmischer Karst). *Sborník Národního Muzea v Praze* 25, B, 1:1–54. Prague.
- MOTTL, M.  
1967 Neuer Beitrag zum *Hystrix*-Horizont Europas. *Annalen des Naturhistorischen Museums Wien* 71:305–327. Vienna.
- MUSIL, R.  
1966 Holštejn, eine neue altpleistozäne Lokalität in Mähren. *Acta Musei Moraviae (Scientiae naturales)* (1966): 133–168. Brno.
- MUSIL, R., editor  
1972 Stránská skála I:1910–1945. *Anthropos* 20, 1–204. Brno.
- NIKIFOROVA, K. V.  
1965 Die Korrelation der unter- und mittelpleistozänen Ablagerungen im nördlichen Eurasien. *Berichte der deutschen Gesellschaft für geologische Wissenschaften*, Reihe A: *Geologie und Paläontologie* 13(3):367–374. Berlin.
- NIKIFOROVA, K. V., editor  
1965 Correlation of Anthropogene deposits of Northern Eurasia. *Akademia Nauk SSSR, Geologičeski Institut*: 1–112. Moscow (in Russian, with English summaries).  
1971 Pleistocene of Tiraspol. *Akademia Nauk SSSR i Akademia Nauk Moldavskaja SSR*: 1–187. Kishinev (in Russian).
- NIKIFOROVA, K. V., I. K. IVANOVA, N. A. KONSTANTINOVA  
1970 Tiraspol as a type locality for the Pleistocene of eastern Europe. *Palaeogeography, Palaeoclimatology, Palaeoecology* 8:175–185. Amsterdam.
- PIDOPLIČKO, I. G.  
1954 On the Ice-age. *Akademia Nauk Ukrainkol SSR*; 1–220. Kiev (in Russian).  
1955 New data on the Anthropogene vertebrate-fauna of Ternopol. *Doklady Akademia Nauk SSSR* 100:989–991. Moscow (in Russian).



- PONTIER, G.  
1928 Les éléphants fossiles d'Abbeville. *Annales de la Société géologique du Nord* 53:20–46. Lille.
- RADULESCO, C., P. SAMSON  
1965 *Soergelia elisabethae* Schaub dans le Pléistocène moyen de l'Olté-  
nie (Roumanie). *Eclogae geologicae Helvetiae* 58(2):1107–1110.  
Basel.
- 1967 Sur un nouveau cerf mégacérin du Pléistocène moyen de la  
Dépression de Braşov (Roumanie). *Geologica Romana* 6:317–344.  
Bucharest.
- RADULESCO, C., P. SAMSON, N. MIHĂILĂ, A. KOVÁCS  
1965 Contributions à la connaissance des faunes de mammifères pléi-  
stocènes de la Dépression de Braşov (Roumanie). *Eiszeitalter und  
Gegenwart* 16:132–188. Öhringen.
- RAKOVEC, I.  
1958 Pleistocenski sesalci iz jame pri Črnem Kalu. *Dissertationes Aca-  
demia Scientiarum et Artium Slovenica, Classis IV, Historia na-  
turalis* 4:367–433. Ljubljana.
- 1959 Kwartana sesalska fauna iz Betalovega Spodmola pri Postojni.  
*Dissertationes Academia Scientiarum et Artium Slovenica, Classis  
IV, Historia naturalis* 5:289–348 Ljubljana.
- RAVSKY, E. I., L. P. ALEXANDROVA, E. A. VANGENGEM, V. G. GERBOVA,  
L. V. GOLUBEVA  
1964 *Anthropogene deposits in the South of Eastern Siberia* (in Rus-  
sian). Moscow: Nauka.
- RUTTE, E.  
1958 Die Fundstelle altpleistozäner Säugetiere von Randersacker bei  
Würzburg. *Geologisches Jahrbuch* 73:737–754. Hannover.
- 1967 Die Cromer-Wirbeltierfundstelle Würzburg-Schalksberg. *Abhand-  
lungen des Naturwissenschaftlichen Vereins Würzburg* 8:1–26.  
Würzburg.
- RYASINA, V. E.  
1962 On the origin and the stratigraphy of Quaternary deposits of the  
steppe plateau of the upper Ob region. *Bulletin Komisii izusche-  
niju Chetvertičnogo Perioda* 27:86–97. Moscow (in Russian).
- SAMSON, P., C. RADULESCO  
1965 Die Säugetierfaunen und die Grenzen Pliozän/Pleistozän und Un-  
terpleistozän/Mittelpleistozän in Rumänien. *Berichte der geolo-  
gischen Gesellschaft in der DDR* 10(1):67–76. Berlin.
- 1968 Das mittlere Pleistozän in Rumänien. *Berichte der deutschen Ge-  
sellschaft für geologische Wissenschaften, Reihe A: Geologie und  
Paläontologie* 13(3):375–379. Berlin.
- SCHÄFER, H. F.  
1909 Über die pleistocäne Säugetierfauna und die Spuren des paläoli-  
thischen Menschen von Burgtonna in Thüringen. *Zeitschrift der  
Deutschen geologischen Gesellschaft* 61(4):445–469. Stuttgart.
- SCHERTZ, E.  
1936 "Die eiszeitliche Tierwelt in der Umgebung Schönebecks."  
Schönebeck.

- SCHÜTT, G.  
1969 *Panthera pardus sickenbergi* n. subsp. aus den Maurer Sanden.  
*Neues Jahrbuch für Geologie und Paläontologie, Monatshefte,  
Jahrgang 1969, Heft 5:299–310. Stuttgart.*
- 1970a Nachweis der Säbelzahnkatze *Homotherium* in den altpleistozänen  
Mosbacher Sanden (Wiesbaden/Hessen). *Neues Jahrbuch für Geo-  
logie und Paläontologie, Monatshefte, Jahrgang 1970, Heft 3:187–  
192. Stuttgart.*
- 1970b Ein Gepardenfund aus den Mosbacher Sanden (Altpleistozän,  
Wiesbaden). *Mainzer Naturwissenschaftliches Archiv* 9:118–131.  
Mainz.
- 1971 Die Hyänen der Mosbacher Sande (Altpleistozän, Wiesbaden,  
Hessen) mit einem Beitrag zur Stammesgeschichte der Gattung  
*Crocota*. *Mainzer Naturwissenschaftliches Archiv* 10:29–76. Mainz.
- SHER, A. V.  
1969 Early Pleistocene mammals of extreme northeastern Asia and  
their environment. *Résumés des Communications, VIIIe Congres  
INQUA* (1969): 135. Paris.
- 1971 Säugetierfunde und Pleistozänstratigraphie in der Kolyma-Niede-  
rung. *Berichte der deutschen Gesellschaft für geologische Wissen-  
schaften, Reihe A: Geologie und Paläontologie* 16(2):113–125.  
Berlin.
- 1971 *Mammals and stratigraphy of the Pleistocene of the extreme  
northeast of the USSR and of North America* (in Russian). Mos-  
cow: Nauka.
- SICKENBERG, O.  
1962 Die Säugetierreste aus den elsterzeitlichen Kiesen (Pleistozän) von  
Bornhausen am Harz. *Geologisches Jahrbuch* 79:707–736. Han-  
nover.
- 1966 Die Wirbeltierfauna der Höhle Petralona (Griechenland). *Eiszeit-  
alter und Gegenwart* 17:214–215. Öhringen.
- 1971 Revision der Wirbeltierfauna der Höhle Petralona (Griech. Maze-  
donien). *Annales géologiques des pays Helléniques* 23:230–264.  
Athens.
- TERZEA, E., T. JURCSAK  
1968 Bemerkungen über die mittelpleistozänen Faunen von Betfia. *Be-  
richte der deutschen Gesellschaft für geologische Wissenschaften,  
Reihe A: Geologie und Paläontologie* 13(3):381–390. Berlin.
- TOBIEN, H.  
1968 *Anancus arvernensis* (Croizet and Jobert) und *Mammut borsoni*  
(Hays) (Proboscidea, Mamm.) aus den pleistozänen Sanden bei  
Wiesbaden (Hessen). *Mainzer Naturwissenschaftliches Archiv* 7:  
35–54. Mainz.
- VANGENGEM, E. A.  
1961 Palaeontological basis of the stratigraphy of the Anthropogene  
deposits of Northeast Siberia. *Trudy geologičeskogo Instituta,  
Akademia Nauk SSSR* 48:1–182. Moscow (in Russian).
- VANGENGEM, E. A., E. I. RAVSKY  
1965 "On the intracontinental type of natural zonality of Eurasia in



- the Quaternary Period (Anthropogene)," in *Problems of Cenozoic stratigraphy* (in Russian), 128-141. Moscow: Nedra.
- VANGENGEM, E. A., A. V. SHER  
1970 Siberian equivalents of the Tiraspol faunal complex. *Palaeogeography, Palaeoclimatology, Palaeoecology* 8:197-207. Amsterdam.
- VANGENGEM, E. A., V. S. ZAZHIGIN  
1965 "Some results of the study of Quaternary mammals of West Siberia," in *Principal problems for the study of the Quaternary Period* (in Russian), 301-310. Moscow: Nauka.  
1969 "Eopleistocene mammals of Siberia as compared to those of Eastern Europe," in *The main Problems of Anthropogene geology in Eurasia* (in Russian), 47-58. Moscow: Nauka.
- VANGENGEM, E. A., E. I. BELAJEVA, V. E. GARUTT, E. L. DMITRIJEVA, V. S. ZAZHIGIN  
1966 Eopleistocene mammals of western Transbaikalia. *Trudy geologičeskogo Instituta, Akademia Nauk SSSR* 152:1-162. Moscow (in Russian).
- VASILYEV, Y M.  
1961 "Anthropogene deposits of southern Zavolzhie," in *Problems of Anthropogene geology* (in Russian, English summary), 107-116. Moscow: Akademia Nauk SSSR, Institut geologii (INQUA, Warszawa).
- VEKUA, A. K.  
1962 Lower Pleistocene mammalian fauna of Achalkalaki. *Akademia Nauk Gruisinskoi SSR*: 1-207. Tbilisi (in Georgian, English summary).
- VEREŠČAGIN, N. K.  
1957 Remains of fossil mammals from the lower Quaternary deposits of the Taman peninsula. *Trudy zoologičeskogo Instituta Akademii Nauk SSSR* 22:9-74. Moscow (in Russian).  
1959 Mammals of the Caucasus. The history of faunal evolution. *Akademia Nauk SSSR i Akademia Nauk Azerbaidshanskoi SSR*: 1-704. Moscow-Leningrad (in Russian).
- VOLKOVA, V. S.  
1966 Quaternary deposits of the Lower Irtisch region and their biostratigraphic characteristic. *Akademia Nauk SSSR, Sibirski*: 1-173. Novosibirsk (in Russian).

## *Mid-Pleistocene Microfaunas of Continental Europe and Adjoining Areas*

DÉNES JÁNOSSY

### ABSTRACT

The author subdivides the Middle Pleistocene of temperate Europe and adjoining areas into four larger and nine smaller "faunal waves" on the basis of small vertebrates. This stratigraphic sketch is based chiefly on the only irreversible event, the evolutionary stages of microvertebrates. Included are considerations of their allometric relations and the predominance of different forms. By these means a much more detailed subdivision of the corresponding time span is possible than formerly, when only large mammals were used. The climatic significance of the microvertebrates is also dealt with in a critical fashion.

As I have discussed in detail in previous papers (Jánossy 1969, 1970a, 1970b, etc.), recent research has increasingly shown that the Middle Pleistocene, formerly considered a "nonexistent" time interval, must have been an important period from the evolutionary and biostratigraphic point of view. There are few absolute chronological data from this interval which lies between the classical Lower and Upper Pleistocene in Europe; we divide it by the only irreversible event of geochronology: the evolution of life. This demands a comprehensive investigation of microvertebrate successions, together, of course, with the macromammals of somewhat slower evolutionary rates.

In this respect, we can say that, according to the newer absolute chronological data, the same generalization is valid for the Pleistocene as is applied to some previous geological periods: the older parts of the time unit are, on an absolute chronological scale, regularly longer than the younger ones (e.g. the Paleozoic was longer than the Mesozoic and Cenozoic together, the Eocene was much longer than the Pliocene, etc.). Therefore, we may approximate the ratio of Lower to Middle to Upper Pleistocene, in absolute chronology, as three: two: one. We are able to