Eiszeitalter u. Gegenwart	Band 23/24	Seite 333-339	Öhringen/Württ., 15. Oktober 1973

D. Palaeozoological Research

by Horst Remy, Bonn

translated by U. Burek, S. Chrulev and R. Thomas, Tübingen

1. Molluscs

Comprehensive studies of Pleistocene land- and freshwater molluscs have so far been largely restricted to the faunas of interglacial and Würmian glacial deposits, and to the history of postglacial faunas. Ant has reconstructed the postglacial history of changes in landsnail distributions in NW-Germany and Westphalia (Ant 1963a, 1967). The present day fauna consists of a preexisting fauna ("Urfauna") together with postglacial immigrants. The elements of the "Urfauna" are eurythermal species, which were already living in NW-Germany during Würm Glaciation. These species comprise about 24 % of the present day fauna. In the South German periglacial region this portion is rather higher. Microclimatic conditions must have been more favourable in this region, presumably because the influence of the alpine ice mass was not as strong as that of the continental ice sheet to the north. There were many ecological niches whose local climates were more favourable for the survival of such species. Along the south coast of England, SW of the land connection with the continent, several migrant species survived (Atlanto-Britannic Fauna). In the forested region west of the Urals, the species wich today constitute the Siberio-Asiatic Fauna survived, while the immigrant species of the Mediterranean Fauna survived on the E-coast of Spain, on the W-coast of Italy and SE-Europe. It is not yet certain where some of the immigrant species lived during the glaciation; possibly these forms survived the ice age in S-Germany and the adjoining regions. During the recolonisation of the former periglacial areas, not all of the species were able to reestablish themselves in their former habitats. Nevertheless, 61 % of the living landsnails of NW-Germany are known from preglacial deposits, while 79 % of the modern species have been recognized in the deposits of the various interglacials.

Studies of the history of postglacial landsnail distributions could resolve the questions raised by the glacial relics. There are no glacial relics among the landsnails of Central Europe. Species which have been identified as such have disjunct geographic distributions which are the result of postglacial climatic changes (Atlantikum). The stenotopic Sibero-Asiatic species from the summits of the low mountains of Central Germany are good examples of this phenomenon (Ant 1966).

Recent work on the deposits of the Würm glaciation shows more and more clearly that the periglacial region was continously inhabited by landsnails (Remy 1969). Semiarid conditions in this region led to the upward movement of water through the soil during the glaciation. Under these conditions loess soils provide favourable living conditions for landsnails. Thus the extensive deposits of loess contributed to the survival of a relatively rich fauna in this region. About 25 species of landsnails were able to survive the glaciation in this biotope, in NW-Germany (Ant 1969). Nevertheless, the climatic conditions in nearby regions, such as southern and southeastern Germany, must have been more favourable, since additional species which migrated into the periglacial area during relatively short interstadial periods of climatic amelioration could only have come from these

regions. Some of the species of the *Striata* fauna were such migrants. These regions were refuges for such species during the times of maximum glaciation. Likewise certain areas of the Alps and even Scandinavia (ice free nunataks), as well as parts of the coast of NW-Scandinavia influenced by the Gulf Stream should be considered as possible refuges for some species (ANT 1969).

Studies of the moisture requirements of several snail species (ANT 1963a) and the relationship between shell-bearing snails and the composition of the soil (M. and K. BRUNNACKER 1959a) explain the abundance of both species and individuals. In general, favourable conditions of air and soil moisture lead to an increase in the number of species. Soil moisture depends primarily on the structure of the soil; loess soils are good for snails, but clay soils are unfavourable, especially since they provide difficult conditions for the sliding movements of the snails. The numbers of species and individuals in forests increase from "pseudogley" to "mullrendzina" soils, while on soils with low carbonate contents the number of species and individuals decrease with increasing acidity.

Systematic investigations of the abundance and distribution of molluscs in glacial sections have so far only been made on the deposits of the Würm glaciation in the Rhine Valley (REMY 1969). During the deposition of the early Würm humus zones a temperate-steppe fauna (*Striata* fauna) occupied this region. The relatively dry, cold climate of the middle and younger Würm is then represented by the *Pupilla* fauna. Sediments deposited in wetter environments are characterised by greater abundance of both species and individuals. During short periods of climatic amelioration the *Striata* fauna became impoverished, while during periods of extreme cold species tolerant of these conditions (for example, *P. loessica* and *C. columella)* appear. Surprisingly, the most cold-tolerant faunas are sometimes associated with soils which formed in wet environments. However, at certain horizons, the abundance of snail shells seems not only to increase with the moisture content of the soil; it is also related to periods of non-deposition on the loess. The primary pur pose of studies of the molluscs faunas is to answer climatic and stratigraphic questions. In the southern German area, M. and K. BRUNNACKER (1956, 1959b, 1962), DEHM (1971), HAESSLEIN (1958a, b, 1959a, b) and MÜNZING (1963, 1966a, b, 1968, 1970) have been able to characterise the climatic and ecological conditions under which several deposits accumulated, by means of faunal analyses. For the most part these faunas are from interglacial and postglacial sediments. Faunal analyses from adjacent regions are also available, and these have contributed to our understanding of the ecological and climatic conditions over a wider area. A late-Pleistocene loess profile in North Hessen has been studied by HUCKRIEDE and JACOBSHAGEN (1963); a fauna of the Würm glaciation from Westphalia by ANT (1968); and a fauna of the Holstein Interglacial from the lower Rhine by KEMPF (1968).

Recently, rather more detailed studies of the molluscan fauna of the Mosbach Sand have been made by GEISSERT (1970). The conclusions already drawn by other palaeontologists on the basis of the mammal fauna were largely substantiated. The middle Mosbach Sand is characterised by an interglacial fauna, while species tolerant of extreme glacial conditions *(C. columella* and *V. tenuilabris)* occur in the upper Mosbach Sand. These cold-tolerant species are accompanied by a rich fauna of Boreal-Alpine freshwater molluscs as well as species typical of steppes and treeless landscapes. The identification of the fauna discovered by WENZ (1914) at the base of the middle Mosbach Sand with *C. columella* is not well established. Thus the existence of a cold period preceding the warm Cromer interval in this region has not yet been proved on the basis of the faunas. However, these studies of the molluscs of the Mosbach Sands indicate that a more detailed subdivision of the Cromer Interglacial — Mindel Glacial period can be made. It should then be possible to make more definite statements about the minor climatological changes which must have occured around the Early — Middle Pleistocene boundary.

Comparative analyses of loess faunas of the various glacial periods from west-central Europe show that the most marked decrease in temperature, or climatic deterioration occured in the Rhine Valley region, during the Riss Glacial *(Columella* faunas). It was at this time that the ice reached its maximum extent on the western part of the European continent (REMY 1968).

Less emphasis has been placed on studies of molluscan faunas from river and lake deposits, although favourable conditions for the preservation of shells are common in these environments, and abundant material can be obtained. Investigations of the cley sediments at Jockrim (GEISSERT 1967) and of the Mosbach molluscs (GEISSERT 1970) should lead to more comprehensive studies of the South German riversystems. On the north side of the Rheinischen Schiefergebirge, the extensive studies of STEUSLOFF on the right-hand tributaries of the Rhine are being continued (ANT 1963a). The post-glacial history of recolonisation of the lakes and rivers is being studied in Hessen and North Germany by HUCKRIEDE (1965), HUCKRIEDE and BERDAU (1970).

These and other studies should lead to a better understanding of the distribution in space and time of the individual species. These in turn will facilitate the evolution of specific ecological and climatic contentions. Evidently, local ecological and climatic conditions, influenced by different regional factors, caused repeated changes in faunal compositions, they should nevertheless in many cases be sufficient for the differentiation of discrete time intervals and faunal provinces.

2. Mammals

The emphasis in research is placed in the systematic investigation of micro-mammalian faunas from cave- and fissure deposits, as well as of faunas from established localities (for example Mosbach near Wiesbaden). Animal groups and individual species have also contributed to this research. Questions which elucidate ecology, climate and stratigraphy are paramount. But of course due to their very nature the question of genetic development in mammals is of special interest.

Investigations of faunas from cave and fissure deposits have been extensively undertaken in recent years. Whereby emphasis has been layed on such deposits from the Suevian and Franconian Jurassic (BRUNNER, DEHM, HELLER, v. KOENIGSWALD). In this connection micromammals play a very important roll, as they are employed more and more for the drawing up of boundaries (JANOSSY 1961, 1969; HELLER 1969). Here the period from lower Pleistocene to the early Middle-Pleistocene (Cromer Interglacial/Mindel Glacial) has been the focal point of our attention. As yet the exact age of most faunas is uncertain, since for the warmer and cooler faunas the Cromer Interglacial was considered, were as for faunas characterised by cold climates the Mindel Glacial was employed. An exact differentiation of the stratigraphic sequence for this period time is a prerequisite to classify faunas of cooler climatic conditions, not only in the Cromer Interglacial but perhaps also in the far more differentiated Mindel with its divers changes from warmer to colder periods. Where to place the boundary dividing the Cromerian from older deposits must remain undecided at the moment. Obviously colder tolerant faunas or such faunas as can (on account of their climatic features) be clearly seperated from the main faunal element lack as yet a stratigraphical clear position.

In recent years our knowledge of the fauna from the Mosbach Sands has been considerably extended. Old collections have been restudied and compiled in monographs (KAHLKE 1960, 1961). A considerable amount has been collected since the 2. worldwar;

however, the larger part of this material bears no stratigraphical particulars, a fact which makes the interpretation of faunal development difficult and in part impossible. Similar the exact stratigraphic classification, as well as attributing of faunal elements to certain climatic phases was rendered difficult. An interesting fact is the certain evidence that the Ren belongs within the Mosbach Sands (KAHLKE 1963, KAHLKE & WEISMANTEL 1961), which first grains its full importance when the age of the locality can be unequivocal stated.

Alone the investigations of the elephant fauna (GUENTHER 1968, 1969) demonstrate that the deposition of the Mosbach complex must have extended over a considerable period of time. According to GUENTHER's investigations the Mosbach Sands would extend far back to the beginnings of the Pleistocene, perhaps even into the uppermost Pliocene (Asti ?). On the other hand the upper Mosbach beds must, according to the same author, extent to within the younger Elster Glacial or even into the older part of the Saale glaciation. According to this point of view this area of sedimentation would have existed for the entire lower and for the greater part of the middle Pleistocene.

It is of interest to note that according to latest investigations (SCHÜTT 1970, 1971) some older forms persist until high up in this depositional complex (for example *Hyaena perrieri, Acinonyx pardinensis);* this means that older forms do not necessarily indicate great age of the beds in question. They rather indicate considerable stratigraphic extent. The Central European genus *Mimomys* dies out in the upper Cromer Interglacial (HELLER 1969, JANOSSY 1969). Probably all ancient forms represented in the Mosbach fauna migrated from the Rhine - Main area during the Mindel-Elster Glacial era. With the onset of the Mindel-Elster Glacial in Central Europe there would appear to be a not inconsiderable faunal caesura. The younger more adapted forms were already extinct at this time due to the restriction of their adaptions. A number of forms occuring in the Mosbach Sands exhibit closer relations to recent rather as to ancient forms (BAHLO & MALEC 1969, BAHLO 1971, HEMMER & SCHÜTT 1969, TOBIEN 1957, KAHLKE 1961, GUENTHER 1968, HELLER 1969, SCHÜTT 1971). Some transitional forms are obviously restricted to short periods of time: *Panthera pardus sickenbergi* — a leopard form from the socalled Mosbachium (SCHÜTT 1969a). In which period did their adaption take place? The vole assosiation of the middle Mosbach Sands characterised by *Arvicola, Pitymus Microtus* should be looked upon as a cool to temperate fauna, but certainly not as a cold-tolerant fauna due to the true mice of the genus *Apodemus.* Vole forms such as *Arvicola* (arising from *Mimomys)* should be taken as indication (see also the Ren locality) that the period of the middle Mosbach Sands with the main fauna must have been proceeded by colder periods (HELLER 1969).

K. D. ADAM (1961) and E. RUTTE (1967) stressed the uniformity of the Cromer complex. Recent investigations suggest, that subdivisions within the Mosbach Sands will become possible, since some ancient species gradually die out and modern forms which in part conform to recent species appear. In this connection it does not appear that regional climatic factors lead to this change in the fauna, but rather the consequences of a true changing adaptional process (HELLER 1969). Especially the Rhine-Main area would not appear before the Mindel glacial to have been affected by any decisive climatic influences resulting from a noticably cold climate. This means that in this area quite ancient forms could maintain themselves. A part of it were probably driven out by more modern forms than by the hardships of a glacial climate. *Hippopotamus* certainly succumbed to climatic changes, since the occurence of this form appears to be restricted to a period of time prior to the Mindel glacial (ADAM 1965). The exact investigation of the Mosbach fauna and the entire stratal complex will be of importance for an elucidation of the upper Pleistocene riversystem in SW-Germany. Perhaps then specimens originating from ex-

posures on the west bank of the Rhine could then be better interpreted and classified (KUSS 1961).

The numerous faunal descriptions from the loess (JACOBSHAGEN, HUCKRIEDE & JACOBSHAGEN 1963; BOECKER, LEHMAN & REMY 1972; NOBIS 1970, ROTHAUSEN 1970), cave and fissure deposits (HELLER 1960, 1963, 1964, 1966; SCHÜTT 1968, 1969 b), terrace deposits (HELLER & BRUNNACKER 1966), volcanic tuffs (KUSS & RAHM 1967) and morain deposits of northern Germany (GUENTHER 1962, 1964), are completing more and more the picture of the animal world of the Pleistocene. Publication of old specimens will give us sufficient material for an interpretation which will enable us to evaluate with greater authenticity the deposits and stages of the Pleistocene.

3. Ostracods

Ostracods are not rare in interglacial deposits. Extensive collections from fluviatile and lacustrine deposits within Kempten—Krefeld beds (=Holstein Interglacial) have been collected from the Lower Rhine (KEMPF 1966, 1967 a). Comparisons with other faunas — i. e. from the Paludina beds of Berlin and other interglacial deposits — indicate that there are no special index forms among the ostracods.

Recently complete ostracod faunas have been described from interstadial and stadial beds of the clay and loess quarry Neuwieder basin (KEMPF 1967 b). Just as in present days tundra areas numerous pools exist during the arctic summer, similar milieus should have existed in periglacial areas of the Pleistocene. Ostracods which developed rapidly could certainly have lived during colder phases (stadial), whereas forms which developed more slowly occur in the interstadial.

The extensive material found permits us to draw up ostracod diagrams. Ostracods are extensively used for the ecological and climatic interpretation of glacial deposits; perhaps ostracod diagrams could also prove stratigraphical interest.

Bibliography

1. Molluscs

ANT, H.: Faunistische, ökologische und tiergeographische Untersuchungen zur Verbreitung der Landschnecken in Nordwestdeutschland. — Abh. Landesmus. Naturkunde Münster, 25. Jg., 1—125, Münster 1963 (1963a).

— : Die würm-periglaziale Molluskenfauna des Lippe- und Ahse-Tales bei Hamm. — N. Jb. Geol. Paläont. Mh. 1963, 77—86, Stuttgart 1963 (1963b).

— : Die Bedeutung der Eiszeiten für die rezente Verbreitung der europäischen Landgastropoden. — Malacologia, **5**, 61—62, 1966.

— : Die Geschichte der westfälischen Landschneckenfauna. — Veröffentl. Naturw. Vereinigung Lüdenscheid, H. 7, 35—47, 1967.

— : Zur würm-glazialen Überdauerung europäischer Landgastropoden in Eisrandnähe. — Malacologia, **9**, 249—250, 1969.

BRUNNACKER, M. & BRUNNACKER, K.: Die Molluskenfauna einiger Lößprofile im Donautal. — Geol. Bl. NO-Bayern, **6**, 96—106, Erlangen 1956.

— : Gehäuseschneckenfauna und Boden. — Zool. Anz., **163**, 128—134, Leipzig 1959 (1959 a).

— : Die Molluskenfauna im Kalktuff von Egloffstein (nördl. Frankenalb). — Geol. Bl. NO-Bayern, **9**, 135—140, Erlangen 1959 (1959 b).

— : Weitere Funde pleistozäner Molluskenfaunen bei München. — Eiszeitalter u. Gegenwart, **13**, 129—137, Öhringen/Württ. 1962.

DEHM, R.: Eine altpleistozäne Spaltenfüllung von Weißenburg in Bayern und ihre Molluskenfauna. — Mitt. Bayer. Staatssammlung Paläont. hist. Geol., **11**, 77—85, 1971.

Geissert, F.: Fossile Pflanzenreste und Mollusken aus dem Tonlager von Jockgrim in der Pfalz. — Mitt. bad. Landesver. Naturkde. u. Naturschutz, N. F. **9**, 443—458, Freiburg i. Br. 1967.
— : Mollusken aus den pleistozänen Mosbacher Sanden bei Wiesbaden (Hessen). — Mainzer Naturw. Arch., **9**, 147—203, Mainz 1970.
Haesslein, L.: Bemerkenswertes Helicigona-Vorkommen im Diluvium einer fränkischen Höhle. — Arch. Molluskenkde., **87**, 37—40, Frankfurt a. M. 1958 (1958 a).
— : Molluska In: Brunner, G.: Nachtrag zur Breitenberghöhle bei Gößweinstein (Ofr.). — N. Jb. Geol. Paläont., Mh., 514, Stuttgart 1958 (1958 b).
— : Mollusken. In: Brunner, G.: Der Schmiedberg-Abri bei Hirschberg (Oberpfalz). — Paläont. Z. **33**, 158—159, 1959 (1959 a).
— : Die Mollusken. In: Brunner, G.: Das Reichentalloch bei Hirschbach (Opf.). — Eiszeitalter u. Gegenwart, **10**, 56—64, Öhringen/Württ. 1959 (1959 b).
Huckriede, R.: Eine frühholozäne ruderatus-Fauna im Amöneburger Becken (Mollusca, Hessen). — Notizbl. hess. L.-Amt Bodenforsch., **93**, 196—206, Wiesbaden 1965.
Huckriede, R. & Berdau, D.: Die süd- und westeuropäische Flußperlmuschel Margaritifera auricularia (Spengler) im Holozän von Hannover. — Geologica et Palaeontologica, **4**, 195—201, Marburg 1970.
Huckriede, R. & Jacobshagen, V.: Eine Faunenfolge aus dem jungpleistozänen Löß bei Bad Wildungen. 2. Die Fundschichten. — Abh. hess. L.-Amt Bodenforsch., **44**, 93—105, Wiesbaden 1963.
Kempf, E. K.: Mollusken aus dem Holstein-Interglazial des Niederrheingebietes. — Arch. Molluskenkunde, **98**, 1—22, 1968.
Münzing, K.: Mollusken aus Kalktuffen in der Umgebung von Niedereschach (Ldkr. Villingen). — Mitt. Bad. Landesver. Naturkde. u. Naturschutz, N. F. **8**, 409—410, Freiburg/Br. 1963
— : Quartäre Molluskenfaunen aus Baden-Württemberg. — Jh. Geol. Landesamt Baden-Württ., **8**, 47—62, Freiburg/Br. 1966 (1966 a).
— : Eine molluskenführende Pleistozänterrasse im Tal der Großen Lauter (Schwäbische Alb). — Jber. u. Mitt. oberrh. geol. Ver., N. F. **48**, 25—30, Stuttgart 1966 (1966 b).
— : Molluskenfaunen aus altpleistozänen Neckarablagerungen. — Jh. geol. Landesamt Baden-Württ., **10**, 105—119, Freiburg/Br. 1968.
— : Mollusken aus dem interglazialen Quellkalk von Hausen i. T. (Landkreis Stockach). — Mitt. bad. Landesver. Naturkde. u. Naturschutz, N. F. **10**, 271—272, Freiburg/Br. 1970.
Remy, H.: Zur Stratigraphie und Klimaentwicklung des jüngeren Pleistozäns in Mittel- und Westeuropa unter besonderer Berücksichtigung des Lösses. — Decheniana, **121**, 121—145, Bonn 1968.
— : Würmzeitliche Molluskenfaunen aus Lößserien des Rheingaues und des nördlichen Rheinhessens. — Notizbl. hess. L.-Amt Bodenforsch., **97**, 98—116, Wiesbaden 1969.

2. Mammals

Adam, K. D.: Die Bedeutung der pleistozänen Säugetier-Faunen Mitteleuropas für die Geschichte des Eiszeitalters. — Stuttgarter Beiträge zur Naturk., **78**, 1—34, Stuttgart 1961.
— : Neue Flußpferd-Funde am Oberrhein. — Jh. geol. Landesamt Baden-Württemberg, **7**, 621—631, Freiburg 1965.
Bahlo, E.: Cerviden-(Mammalia) Reste aus den Oberen Mosbacher Sanden (Mittelpleistozän) bei Wiesbaden (Hessen). — Abh. hess. L.-Amt Bodenforsch., **60** (Heinz-Tobien-Festschrift), 17—24, Wiesbaden 1971.
Bahlo, E. & Malec, F.: Insectivoren (Mammalia) aus den oberen Mosbacher Sanden (Mittelpleistozän) bei Wiesbaden-Biebrich/Hessen. — Mainzer naturw. Arch., **8**, 56—76, Mainz 1969.
Boeker, M., v. Lehmann, E. & Remy, H.: Über eine Wirbeltierfauna aus den jüngsten würmzeitlichen Ablagerungen am Michelberg bei Ochtendung/Neuwieder Becken. — Decheniana, **124**, 119—134, Bonn 1972.
Guenther, E. W.: Pleistozäne Säugetiere in Schleswig-Holstein. — Z. f. Tierzüchtung u. Züchtungsbiologie, **77**, 238—241, 1962.
— : Säugetierreste aus eiszeitlichen Ablagerungen von Schleswig-Holstein. — Lauenburgische Heimat, N. F. **45**, 48—52, 1964.
— : Elefantenbackenzähne aus den Mosbacher Sanden. — Mainzer naturw. Arch., **7**, 55—73, Mainz 1968.
— : Elefantenbackenzähne aus den Mosbacher Sanden II. Die Funde des Naturhistorischen Museums der Stadt Mainz. — Mainzer Naturw. Arch., **8**, 77—89, Mainz 1969.
Heller, Fl.: Das Diluvialprofil der Jungfernhöhle bei Tiefenellern, Landkreis Bamberg. — Erlanger geol. Abh., **34**, 3—17, Erlangen 1960.
— : Ein bedeutsames Quartärprofil in einer Höhlenruine bei Hunas/Hartmannshof (Nördliche Frankenalb). — 2. Vorbericht — Eiszeitalter u. Gegenwart, **14**, 11—116, Öhringen/Württ. 1963.

— : Eine fossilführende Karstschlotte mit Jung-Mammut-Resten bei Langenaltheim/Mfr. — Geol. Bavarica, **53**, 102—128, München 1964.
— : Die Fauna von Hunas (nördliche Frankenalb) im Rahmen der deutschen Quartärfaunen. — Eiszeitalter u. Gegenwart, **17**, 113—117, Öhringen 1966.
— : Eine Kleinsäugerfauna aus den mittleren Mosbacher Sanden bei Wiesbaden-Biebrich/Hessen. — Mainzer Naturw. Arch., **8**, 25—55, Mainz 1969.
Heller, Fl. & Brunnacker, K.: Halsbandlemming-Reste aus einer Oberen Mittelterrasse des Rheines bei Niederaußem. — Eiszeitalter u. Gegenwart, **17**, 97—112, Öhringen/Württ. 1966.
Hemmer, H. & Schütt, G.: Ein Unterkiefer von Panthera gombaszoegensis (Kretzoi, 1938) aus den Mosbacher Sanden. — Mainzer Naturw. Arch., **8**, 90—101, Mainz 1969.
Jacobshagen, E., Huckriede, R. & Jacobshagen, V.: Eine Faunenfolge aus dem jungpleistozänen Löß bei Bad Wildungen. — Abh. hess. L.-Amt Bodenforsch., **44**, 5—105, Wiesbaden 1963.
Janossy, D.: Die Entwicklung der Kleinsäugerfauna Europas im Pleistozän (Insectivora, Rodentia, Lagomorpha). — Z. Säugetierkde., **26**, 1—11, Berlin 1961.
— : Stratigraphische Auswertung der europäischen mittelpleistozänen Wirbeltierfauna. Teil 1. — Ber. deutsch. Ges. geol. Wiss., A, Geol. Paläont., **14**, 367—438, Berlin 1969.
Kahlke, H. D.: Die Cervidenreste aus den altpleistozänen Sanden von Mosbach (Bieberich-Wiesbaden). Teil 1. Die Geweihe, Gehörne und Gebisse. — Abh. deutsch. Akad. Wiss., Kl. Chemie, Geol., Biol. 1959, **7**, 75 S., Berlin 1960.
— : Revision der Säugetierfaunen der klassischen deutschen Pleistozän-Fundstellen von Süßenborn, Mosbach und Taubach. — Geologie, **10**, 493—532, Berlin 1961.
— : Rangifer aus den Sanden von Mosbach. — Paläont. Z., **37**, 277—282, Stuttgart 1963.
Kahlke, H. D. & Weismantel, J.: Rentierfund im Rhein-Main-Gebiet. — Das neue Mainz, Wirtschaft, Verkehr, Kultur, **5**, 1961.
Kuss, S.: Ein Beitrag zur Pleistozän-Fauna von Herxheim/Pfalz. — Ber. Naturf. Ges. Freiburg i. Br., **51**, 145—148, Freiburg 1961.
Kuss, S. & Rahm, G.: Eine jungpleistozäne Fauna aus dem West-Eifeler Vulkan Hasenberg bei Trittscheid. — Trierer Zeitschr. f. Geschichte u. Kunst d. Trierer Landes u. seiner Nachbargebiete, 30. Jg., Trier 1967.
Nobis, G.: Equiden aus dem Löß von Kärlich (Neuwieder Becken). — Mainzer Naturw. Arch., **9**, 297—302, Mainz 1970.
Rothausen, K.: Praemegaceros portis, 1920 (Cervidae, Mamm.) als wichtiger stratigraphischer Beleg im Quartär von Kärlich/Neuwieder Becken (Mittelrhein). — Mainzer Naturw. Arch., **9**, 303—317, Mainz 1970.
Rutte, E.: Die Cromer-Wirbeltierfundstelle Würzburg-Schalksberg. — Abh. Naturwiss. Ver. Würzburg, **8**, (1967), 1—26, Würzburg 1970.
Schütt, G.: Ein jungpleistozäner Leopardenfund aus der Baumannshöhle bei Rübeland im Harz. — Mitt. Geol. Inst. TU Hannover, **8**, 102—115, Hannover 1968.
— : Panthera pardus sickenbergi n. subsp. aus den Maurer Sanden. — N. Jb. Geol. Paläont. Mh., Jg. 1969, 299—310, Stuttgart 1969 (1969 a).
— : Die jungpleistozäne Fauna der Höhlen bei Rübeland im Harz. — Quartär, **20**, 79—125, 1969 (1969 b).
— : Ein Gepardenfund aus den Mosbacher Sanden (Altpleistozän, Wiesbaden). — Mainzer Naturw. Arch., **9**, 118—131, Mainz 1970.
— : Die Hyaenen der Mosbacher Sande (Altpleistozän, Wiesbaden/Hessen). — Mit einem Beitrag zur Stammesgeschichte der Gattung Crocuta. — Mainzer Naturw. Arch., **10**, 29—76, Mainz 1971.
Tobien, H.: Cuon Hodg. und Gulo Frisch (Carniv.) aus den altpleistozänen Sanden von Mosbach bei Wiesbaden. — Acta Zool. cracoviensia, **2**, 433—450, Krakau 1957.

3. Ostracods

Kempf, E. K.: Das Holstein-Interglazial von Tönisberg im Rahmen des niederrheinischen Pleistozäns. — Eiszeitalter u. Gegenwart, **17**, 5—60, Öhringen 1966.
— : Ostrakoden aus dem Holstein-Interglazial von Tönisberg (Niederrheingebiet). — Monatsber. Dtsch. Akad. Wiss. Berlin, **9**, 119—139, Berlin 1967 (1967 a).
— : Ilyocypris schwarzbachi n. sp. (Crustacea, Ostracoda) und ein vorläufiges Ostrakoden-Diagramm aus dem pleistozänen Löß von Kärlich (Neuwieder Becken). — Sonderveröff. Geol. Inst. Univ. Köln, **13** (Schwarzbach-Heft) 65—79, Köln 1967 (1967 b).

Manuscript received October 5, 1972.

Address of the author: Dr. H. Remy, Institut für Paläontologie, 53 Bonn, Nussallee 8.