

Fossil mammals of southern Aegean islands and their relations to geodynamics of the Aegean area

by

Siegfried E. Kuss, Freiburg i.Br.

Abstract

New knowledges about Neogenic and Pleistocene mammalian faunas of southern Aegean islands make a contribution to understanding of geodynamics of the Aegean area. From Oligocene (?) till Middle Miocene this area has been part of the European continent. Temporarily a connection with faunal exchange existed to North Africa. Parts of the Aegean landmass with relicts of the Neogenic mammalian fauna persisted as islands into Holocene times. Landbridges, conditioned by tectonics and passable only for a small number of mammals, made possible two phases of immigration from the Greek mainland to Crete during the Pleistocene.

Zusammenfassung

Neue Kenntnisse über die neogenen und pleistozänen Säugetierfaunen südägäischer Inseln leisten einen Beitrag zum Verständnis der Geodynamik des ägäischen Raumes. Vom Oligozän (?) bis zum Mittelmiozän war dieses Gebiet Teil des europäischen Festlandes. Kurzfristig bestand Verbindung und Faunenaustausch auch mit Nordafrika. Teile des ägäischen Festlandes blieben als Inseln mit persistierenden neogenen Faunenelementen bis in das Holozän erhalten. Schwer gangbare, durch Tektonik bedingte Landbrücken ermöglichten zweimal während des Pleistozäns Zuwanderungen vom griechischen Festland nach Kreta.

The investigation of fossil mammals of the Aegean area is still in its infancy. Too many islands are not or imperfectly studied to permit a definitive hypothesis. This paper offers in short summary such facts, which have been brought to light.

Until 1968 (BENDA et al.) only mammals of the Pleistocene age were known. They all were considered as immigrants, who had reached the islands from the mainland during Pleistocene times over landbridges (KUSS 1973 and others) or by swimming (SONDAAR & BOEKSCHOTEN), perhaps taking advantage of eustatic fluctuations of the sea level. Since the discovery of some Tertiary mammals in Crete, a better survey of the development of the mammalian fauna is possible now.

Author's address:

Prof. Dr. S. E. KUSS, Geologisch-Paläontologisches Institut der Universität, Hebelstr. 40, D-7800 Freiburg i.Br.

The number of known Tertiary mammals still is small: *Mastodon* (BENDA et al. 1968), *Dorcatherium* (BONNEAU & GINSBURG 1974; KUSS, ined.), *Hipparion* (DE BRUIJN et al. 1971), *Pliohyrax* (KUSS 1976), *Aceratherium*, *Chalicotherium*, *Euprox*, *Palaeotragus*, *Samotherium*, antelopes (KUSS, ined.) and some micromammals. Nevertheless the fact, that there was a rich mammalian fauna on Crete during the Neogene, very similar or identical to that of the European mainland, comes to light. Therefore one draws the conclusion that there was a connection between Crete and the mainland at the time of immigration. A faunule of micromammals (DE BRUIJN & MEULENKAMP) — and recently also *Euprox* and *Aceratherium* — was dated on the Serravallian (BENDA & MEULENKAMP) respectively on Oeningian (BERGGREN & VAN COUVERING), *Pliohyrax* on the Early Vallesian (KUSS 1976) and *Hipparion* on the Upper Vallesian (DE BRUIJN et al.). Before the Serravallian at an undetermined time between Oligocene and Lower Miocene Crete emerged. The faunal character excludes immigration before Burdigalian.

Some of the Cretan Pleistocene mammals are surviving relicts of the Tertiary fauna (KUSS 1973, 1975): two species of stags of the endemic genus *Candiacervus* (KUSS 1975) and some murids. For a newly discovered otter, *Isolalutra*, this question has not been settled (SYMEONIDIS & SONDAAR). No evidence of these forms could be found on the mainland. Related cervids lived on Kasos and Karpathos and perhaps on Amorgos and other islands of the Cyclades (KUSS 1973). All these forms are endemites developing after the island separated from the mainland. The separation took place during the Neogene, after MEULENKAMP & ZACHARIASSE in the Middle Tortonian.

During the Pleistocene new elements reached Crete from the European mainland. Two phases of immigration are discernible. In the first, presumably Old Pleistocene phase, an elephant and *Hippopotamus* succeeded in crossing from the Greek mainland to Crete. Both were in a progressed stage of dwarfism, when the second immigration with *Elephas antiquus*, who is documented in Kythera too, arrived in Crete. This elephant did not reach the same stage of dwarfism of the first mentioned. Formerly, the possibility of passage relied completely on eustatic events. Now the theory is strengthened that passage depended primarily on tectonic events. The restricted number of immigrants makes it likely that these landbridges were not passable for most mammals. Short distances may have been overcome by swimming. Arrival from Asia Minor is excluded because Rhodes as nearest part of the South Aegean Island Arc has produced only continental Pleistocene mammals. The „Karpathosgraben“ (KUSS 1975) may have prevented a faunal exchange in this direction.

On Crete one can observe a direct relation between the geodynamics and the geochronical age of fossils in the karst: Elements of the older Pleistocene mammalian fauna with *Kritimys* and *Hippopotamus* are found only in karst systems of preneogenic rocks. In neogenic rocks, karst systems contain exclusively, elements of the younger fauna with *Mus minotaurus* as index fossil. This means that there are karst systems of different ages and the tectonic events, which caused the karst

formations, are of different ages as well. Therefore the older faultings must have happened before sedimentation of neogenic rocks, the younger faultings thereafter. — This rule is not true on Karpathos.

Pliohyrax is documented at Attika (Pikermi) and Samos in Turolian times. The Vallesian representative of Crete must be taken into consideration as a direct forerunner. It must have reached the Cretan area during a temporary connection with the African continent. One can expect that other African faunal elements have taken the same route and will probably be found in the future.

The Pleistocene stags of genus *Candiacervus*, which inhabited Crete, Kasos and Karpathos, follow the exclusively Cretan murids of genus *Kritimys* in the fact that they are commonly represented by a large and a small species respectively. The larger species of stags is always in the minority. There are some arguments for originally distinct biotops. The conservatism of the larger species gives reason to suppose a less strong pressure of evolution than in the smaller species. These are much more dwarfed.

A surprising contradiction exists between the recent topography of the islands of Kasos and Karpathos on one side and the construction of the extremities of their Pleistocene cervids on the other side. Though the islands are small today, the extremities of cervids were built for quick locomotion in open landscapes. On the contrary the small stag of the relatively large island of Crete, *Candiacervus cretensis* (SIM.), had adapted to a life in mountaneous surroundings. These facts support the theory that Crete was reduced to its present size earlier than Karpathos and Kasos, which are only relicts of an isolated landmass that persisted far into Pleistocene times. The connection with Crete was probably lost during Upper Neogene, because Pleistocene faunal elements did not reach this „Karpathosland“. In the northeastern direction the „Karpathosgraben“ prevented a faunal exchange.

In summary the mammalian faunas of the southern Aegean islands uncover some geodynamical events of the Aegean area:

— During Neogene times a connecting landmass existed between the Greek mainland and Crete across the Aegean Sea of today.

— During a short Neogene period there was a temporary landbridge between North Afrika and Crete.

— Twice during the Pleistocene a possibility of faunal exchange existed between the Greek mainland and Crete. Immigration over Rhodes-Karpathos-Kasos can be excluded.

— The islands discussed are today only relicts of landmasses which persisted for a longer or shorter period of time after the „Aegean land“ broke into pieces.

— Pleistocene faulting tectonics influenced just the geochronological separation of fossil localities.

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References

- BENDA, L., HILTERMANN, H., KUSS, S.E., & SYMEONIDIS, N.K. (1968): Der erste *Mastodon*-Fund der Insel Kreta. — *Ann. Geol. Pays Hellén.*, **21**, 167—177, Athen.
- BENDA, L., & MEULENKAMP, J.E. (1972): Discussion on Biostratigraphic Correlations in the Eastern Mediterranean Neogen. — *Z. Deutsch. Geol. Ges.*, **123**, 559—564, Hannover.
- BERGGREN, W.A., & VAN COUVERING, J.A. (1974): The Late Neogen. — *Dev. Palaeont. and Stratigr.*, **2**, Elsevier Sci. Publ. Comp., Amsterdam, Oxford, New York.
- BONNEAU, M., & GINSBURG, L. (1974): Découverte de *Dorcatherium puyhauberti* ARAMBOURG et PIVETEAU (Mammalia) dans les faciès continentaux de base de la molasse tertiaire de Crète (Grèce): Conséquences stratigraphiques et tectoniques. — *C.R. somm. S.G.F.*
- BRUIJN, H.DE, & MEULENKAMP, J.E. (1972): Late Miocene rodents from the Pandanassa Formation (Prov. Rethymnon), Crete, Greece. — *Proc. Kon. Nederl. Akad. Wetensch. B*, **75**, 54—60.
- BRUIJN, H. DE, SONDAAR, P.Y., & ZACHARIASSE, W.J. (1971): Mammalia and foraminifera from the Neogene of Kastellios Hill, (Crete), a correlation of continental and marine biozones. I. — *Proc. Kon. Nederl. Akad. Wetensch.*, **B. 74**, 5, 1—22.
- KUSS, S.E. (1973): Die pleistozänen Säugetierfaunen der ostmediterranen Inseln. — *Ihr Alter und ihre Herkunft.* — *Ber. Naturf. Ges. Freiburg i.Br.*, **63**, 49—71, Freiburg.
- (1975): Die pleistozänen Hirsche der ostmediterranen Inseln Kreta, Kasos, Karpathos und Rhodos (Griechenland). — *Ber. Naturf. Ges. Freiburg i.Br.*, **65**, 25—79, 8 Abb., 4 Taf., 3 Tab., Freiburg.
- (1976): Ein erster Fund von *Pliohyrax* aus dem Vallesian von Kreta/Griechenland. — *N. Jb. Geol. Paläont. Mh.*, **1976**, 3, 157—162, 1 Abb., Stuttgart.
- KUSS, S.E., & MISONNE, X. (1968): Pleistozäne Muriden der Insel Kreta. — *N. Jb. Geol. Paläont. Abh.*, **132**, 55—69, Stuttgart.
- MEULENKAMP, J.E., & ZACHARIASSE, W.J. (1973): Stratigraphic and Structural Framework of the Messinian Deposits on Crete. — *Kon. Nederl. Akad. Wetensch.*, **202—205**, Amsterdam.
- SONDAAR, P.Y., & BOEKSCHOTEN, G.J. (1967): Quaternary Mammals in the South Aegean Island Arc with Notes on other Fossil Mammals from the Coastal Regions of the Mediterranean. I/II. — *Kon. Nederl. Akad. Wetensch.*, **B. 70**, 5, 556—576, Amsterdam.
- SYMEONIDIS, N.K. & SONDAAR, P.Y. (1975): A new Otter from the Pleistocene of Crete. — *Ann. Géol. Pays Hellén.* **27**, 11—24, Athen.

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